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A COMPREHENSIVE REVIEW OF THE TIME ASPECT  
OF CONSTRUCTION DELAY CLAIMS

A Special Problem  
Presented to  
The Faculty of the School of Civil Engineering  
By  
F.F. Aucremanne  
//

In partial fulfillment  
of the Requirements for the Degree  
Master of Science in Civil Engineering

Georgia Institute of Technology  
August 1986

T230084





A COMPREHENSIVE REVIEW OF THE TIME ASPECT  
OF CONSTRUCTION DELAY CLAIMS

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//





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## ABSTRACT

Schedule deviations are common place in todays construction industry. Their causes are many and their result is often a claim by one party against another. Seldom is the settlement of such claims quick and easy due to the many factors involved in analyzing the claim and the failure of the parties involved to understand these factors.

It is the author's opinion that if the parties of a contract understood the many factors which influence the settlement of delay claims that the claims would be settled sooner and for less cost. This paper provides a comprehensive review of some of these factors. Upon completing this paper the reader should have a basic understanding of the identification, preparation, analysis, and settlement of the time aspect of construction delay claims.



## 1.                    THESIS SCOPE AND OBJECTIVES

### 1.1                    INTRODUCTION

Construction projects involve many interrelated parties and resources interacting in a dynamic yet often severely time constrained environment. Many factors are involved in completing a construction project and without the coordinated cooperative effort of all involved the project will often be delayed for one reason or another. The reality of such delays and the axiom that "Time is Money" has resulted in the growth in the number of construction claims between parties. The claims, whether they are between the owner and the contractor or between contractor and contractor, can almost always be directly related to time.

The owner has lined up buyers or occupants and the owner has arranged the financing based on the anticipated cash flow resulting from sales or rentals. The failure of the contractor to meet the scheduled contract completion date could force the owner to incur additional interest expenses or lost profits. And in the world of multi-million dollar projects a one week delay on a \$30 million project can cost over \$60,000 in additional interest. The owner, in an effort to recover this loss may in turn claim against the contractor for delay damages and request restitution for the reasons stated above.

More often it will be the contractor who has suffered





losses as a result of the owner's actions. The owner or his authorized representative, either through his actions or failure to act, may cause the contractor to deviate from his planned schedule of construction. These deviations may in some manner impact the resources that the contractor has dedicated to the particular project. The contractor may then suffer losses because of lost efficiency, learning curve losses, idle personnel and/or equipment, or be forced into periods of inclement weather or new union contracts with higher wage rates. To recover these losses the contractor will submit a claim against the owner requesting additional monies to cover the added costs that the contractor has incurred. The scenario is very similar for the relationship between prime contractors and their subcontractors, owners and A&E's, and in recent years between owners and Construction Management firms.

The complexity of today's construction projects often prevents the simple assignment of fault for delays and even more difficult, this complexity hampers the clear cut identification of causes and impacts. As the dollar value of projects has increased so has the importance of correctly identifying and quantifying these impacts of deviations in the construction schedule. The result of this complexity and increased dollar value has been the formation of construction law firms who specialize in construction claims and the emergence of construction management firms who do little construction managing at all, rather, they concentrate their



efforts and skills in analyzing construction scheduling claims.

The author, in researching for this paper interviewed five construction law firms, 5 construction management firms, and drew from the experience of being involved in four construction claims as an owner's representative. Upon completion of the research the author concluded that although each profession is expert at what it does, it does not completely understand the mechanics or philosophies of the other professions with respect to settling construction scheduling claims. Therefore, the author set forth in writing a paper with the following objective in mind:

## 1.2 OBJECTIVE

The objective of this paper is to provide the reader an overview of the many factors which affect the identification, preparation, analysis, and settlement of construction scheduling claims. All too often the impacts of a schedule deviation are not quantifiable or even recognizable until long after the cause has occurred. For this reason the facts surrounding the cause frequently are blurred and the assignment of responsibility for the deviation is difficult as best. But, by having an understanding of the basic mechanics of how schedule deviations impact projects and how to identify these impacts early, disputes can be settled before they become unmanageable problems.



### 1.3

### SCOPE

The scope of this paper is limited to a review of the time aspect of construction delay claims. This paper discusses some of the most common causes of schedule deviation and how these deviations are analyzed to calculate their impact on the project schedule. This paper also discusses the litigation of delay claims and the problems associated with litigation. This paper does not cover methods or techniques used to analyze the economic impact of such schedule deviations nor does it discuss the means by which to bring a late project back on schedule.

### 1.4

### PROCEDURE

To provide the reader with a comprehensive review of the time aspect of construction delay claims this paper will discuss the following topics:

Ch 2. Delays, disruptions, suspensions of work, acceleration, and constructive changes. Being able to identify these primary causes of schedule deviation early is paramount to documenting impact and building a case if the contractor or owner decides to submit a claim. This section will discuss these five most common causes of schedule deviation, how they affect construction schedules, and each party's rights and responsibilities under the contract.





Ch 3. Project scheduling techniques. There are numerous techniques by which a project can be scheduled, GANTT CHARTS, SUMMARY BAR CHARTS, The CRITICAL PATH METHOD (CPM (I-J node or precedence)), and Program Evaluation and Review Technique (PERT). This section will discuss each of these, going into greater depth on how CPM networks are developed and the advantages of having one on the project.

Ch 4. Analyzing factual networks. Once a schedule deviation has occurred the use of factual networks can be instrumental in quantifying the impacts. This section will discuss how factual networks are developed and how they used in calculating delays with respect to time.

Ch 5. Settling the claim. Going to litigation is not always the best means by which to settle a claim. This section will discuss the various alternatives to going to court.

Ch 6. Summary. The interviews with the law firms and the construction management firms brought to light some interesting areas of concern.. The paper concludes with a summary of the topics discussed in the paper and addresses these areas of concern.





## 2. THE MOST COMMON CAUSES OF SCHEDULE DEVIATION

### 2.1 INTRODUCTION

There are many causes which can force the contractor to deviate from the original planned schedule. However, the vast majority of these causes can be categorized under one the following headings:

- delays
- disruption
- suspension of work
- acceleration
- constructive changes

By being able to recognize and differentiate between these five very common causes of schedule deviation and knowing their rights with respect to the contract, the owner or contractor can place themselves in a better position to fairly and equitably settle any claims. The following discussion is directed towards these two parties, ie, the owner and the contractor, because in the majority of the cases they are the two parties involved in delay litigation.

### 2.2 DELAYS

Delays are further identified as non-excusable and excusable. Non-excusable delays are delays caused by the



contractor's own actions and therefore the contractor is responsible for their impact. Examples of this are the failure to promptly order long lead items such as chillers or transformers, or to submit required shop drawings in sufficient time to allow for review and approval prior to fabricating structural steel. The extension of the contract period will not be allowed under such circumstances and the contractor will be liable not only for lost productivity on the project but also for liquidated damages if the contract so states. The contractor who delays the project and submits a request for additional time and/or compensation under these premises may create an adverse relationship with the owner in addition to expending funds preparing the claim which will be for naught.

Excusable delays are those delays which allow the contractor to deviate from the planned schedule. These delays are further subdivided into noncompensable and compensable delays. Noncompensable delays generally arise from events that are beyond the control of the contractor or the owner, but nevertheless delay the contractor's timely completion of the project (8). A noncompensable delay may be excusable in that it justifies the contractor's deviation from the planned schedule and disallows the assessment of liquidated damages for not completing the project on time. However, the contractor can not request or claim for any compensation to cover additional costs. Examples of noncompensable delays are labor disputes, vandalism,



unusually severe weather, acts of God, delays caused by suppliers or second tier subcontractors.

Compensable delays on the other hand, give the contractor the right to not only claim for additional time, but also for additional compensation. These delays are caused by the owner or his designated representative. It is the contractor's responsibility, however, to show that the delay was in fact caused by the owner and that in fact additional costs were incurred. Examples of such delays may be the owner's failure to provide requested clarification in a reasonable time on a critical activity, or the owner's failure to deliver equipment or material as agreed in the contract and in accordance with the approved schedule.

Some contracts may contain special modified contractual terms which limit the contractor's rights with respect to delays and compensation, such as the liquidated damages and no-damages-for-delay clauses (B). It is recommended that the contractor review the contract in depth to determine if such clauses have been made a part of the contract. The best recommendation is to have a construction lawyer do this prior to even entering the contract. Otherwise, the contractor may find himself incurring additional costs for which there are no legal means by which to claim compensation.

Proving the extent of an excusable delay is paramount in justifying the amount of compensation requested. The contractor can not simply request the difference between the actual costs and the contract bid price. The courts will





examine closely the extra costs and determine whether the entire extra cost was in fact caused by the excusable delay rather than in some part by the contractor's own inefficiencies (8). Section 4.5 of this paper covers in more depth with how the extent of such delays are calculated.

## 2.3 DISRUPTIONS

Disruptions are different from delays in that there may not be a quantifiable extension of the project duration which results from an owner caused disruption. Disruptions impede the contractor's ability to attain or maintain job momentum and productivity (8). As discussed in the introduction, the cooperation of all parties involved is necessary for a project to work smoothly. In fact, there is an implied contractual obligation of cooperation. Disruptions can cause extra costs in the form of lost efficiency or changed work methods in accomplishing the work. The contractor is entitled to damages resulting from disruptions. However, in that the calculation of such damages is more related to efficiency studies and unit costing this paper will not discuss this matter further.

## 2.4 ACCELERATION

Acceleration can take two forms. The first is when the owner directs the contractor to work faster than necessary to





complete the work by the scheduled contract completion date. The contractor in this case is entitled to the increased cost of the accelerated work plus a reasonable profit. The second case is where the contractor is required to finish by the original contract completion date although the contractor is entitled to an extension of contract time because of the existence of an excusable delay (9). To prove acceleration the courts require certain key elements be shown to allow relief on a claim for constructive acceleration. First there must be an excusable delay for which the owner has failed or refused to grant an extension of the contract time to which the contractor is entitled (9). Second, it must have been expressed or implied to the contractor by the owner or his representative that the contractor was required to complete the contract without an extension, and the contractor must have completed on time and incurred extra costs (9).

The calculation of acceleration damages is very similar to calculating disruption damages. The greatest impacts are not purely a function of time but more so of overtime costs, revised work methods, increased material costs for early delivery, etc. However, by comparing the as-built schedule with the planned schedule in conjunction with planned productivity a contractor can easily show the specific activities which were accelerated. The cost analysis of the impact will require an efficiency study and unit costing analysis. This paper will deal with only the comparison of the schedules.



A suspension of work occurs when the owner either expressly or constructively causes the contractor to suspend any part of the work (8). Suspension of work clauses usually provide the contractor with a legal route by which to recover additional costs (excluding profit) for unreasonable suspensions, delays or interruptions. Conversely, it also protects the owner from liability damages for reasonable delays. The question then arises, "what are unreasonable delays?" It is the contractor's responsibility in claiming restitution to show that the delay or suspension was unreasonable under the circumstances (8). Some delays are per se unreasonable, in which case the contractor does not bear the burden of proof that the delay was unreasonable, but rather the owner has the burden of showing that it acted reasonably (8). Defects in the plans and specifications where the defects are not obvious to the contractor is per se unreasonable. Where the delay was not per se unreasonable there is no clear cut way for determining whether a delay is unreasonable (8).

The owner may also suspend the contractor's work if the work is defective or persistently contrary to the terms of the contract. However, if the owner needlessly stops work due to defects that the contractor could have corrected while continuing work, this would constitute an unreasonable delay



for which the contractor can recover damages.

The calculation of the impact of an unreasonable suspension is easier than the previous mentioned causes because the exact cause, usually a directive, is identifiable. In analyzing the impact of the suspension the costs of idled crews and/or equipment are known and quantifiable. The impact on following activities can also be determined by using factual networks. This will be discussed in section 4.5 of this paper.

## 2.6 CONSTRUCTIVE CHANGES

Formal change orders are normally negotiated with respect to time and cost and are issued in writing by the owner or his authorized representative. Constructive change orders, however, result from informal acts or omissions on the owner's part that change the requirements of the contract. Such actions require the contractor to perform work beyond that required by the contract, increasing the costs of performance, and entitling the contractor to an extension of time (8). Examples of this are directives to change the method of construction, overinspection, rejection of conforming work, defective plans or specifications, or rejection of "or equal" substitutions.

The analysis of such changes to calculate the additional cost and time due the contractor is difficult without detailed records. Section 4.4 of this paper discusses



recommended record keeping which is useful when preparing claims of this type after the fact. Additionally, section 4.5 of this paper discusses the analysis of factual networks, developed from this records, which are then used to determine the time impact of changed work.





### 3. CONSTRUCTION SCHEDULES

#### 3.1 INTRODUCTION

For a contractor to be successful in today's highly competitive construction industry the contractor must use every tool available to allow him to complete a project for less than the competition. One such tool is the project schedule. The schedule, if properly used, allows the contractor to schedule work forces, to coordinate subcontractors, to level resources, and to ultimately control the overall project, bringing it in on time and on budget.

However, many contractors still do not use schedules. Some argue that their costs outweigh their benefits. Others believe that their experience is better than any schedule. Yet, when the highly successful contractor's operations are examined, there will be found at the center a well thought out manageable schedule. The contractor will use the schedule for all his planning and he will contractually tie his subcontractors to it. This way the contractor can not only monitor the project, but he can also control it, identifying problem areas and taking remedial action where required. In this section this paper will review the various types of scheduling techniques, their development, basic concepts, and uses. Because of its wide spread use and its potential as one of the best scheduling tools for



construction, a more in-depth discussion on the critical path method (CPM) is provided.

## 3.2 SCHEDULING TECHNIQUES

### 3.2.1 GANTT CHARTS

In the early 1900's Henry L. Gantt and Frederick Taylor developed and made popular what is the basis for today's bar graphs or bar charts. Their work was originally aimed at production scheduling, however, it was and is readily adaptable to planning construction and recording its progress (6). The bar graphs provide an excellent tool by which to graphically represent an activity. In the preparation of a bar graph the planner or scheduler is guided by desired completion dates and thus often works backwards in generating a bar graph for a multi-activity project. This "backwards planning" however, often results in little more than a schedule of wishful thinking (6). An example of a bar graph for the construction of a simple one story home is shown in Figure (3a).

Another drawback or deficiency of bar graphs is its failure to show the interdependencies of the various activities which make up the project. Additionally, although the bar graph can provide a rough idea of the status of the project, it can not be readily used to give guidance on how a late project should be brought back on schedule. For example,



if the bar graph in Figure (3a) is updated to the midpoint of the project (midpoint in terms of time) it can be seen in Figure (3b) that the project appears to be late. Other than accelerating those activities which are behind, the bar graph provides little or no other information which the project manager can use to salvage the project.

#	ACTIVITY	D D	U A	WEEK NUMBER												
				0	1	2	3	4	5	6	7	8	9	10	11	12
				R Y												
1	excavate footings	4.5	S	***												
			A													
2	foundation	4	S	****												
			A													
3	under slab utilities	1	S	*												
			A													
4	slab	3	S	***												
			A													
5	frame	10	S				*****									
			A													
6	exterior walls	16	S				*****									
			A													
7	roof	3	S							***						
			A													
8	rough utilities	7	S							*****						
			A													
9	interior finish	20	S							*****						
			A													
10	finish utilities	4	S											****		
			A													
11	paint	10	S											*****		
			A													
12	landscape	3	S											***		
			A													

Figure (3A)





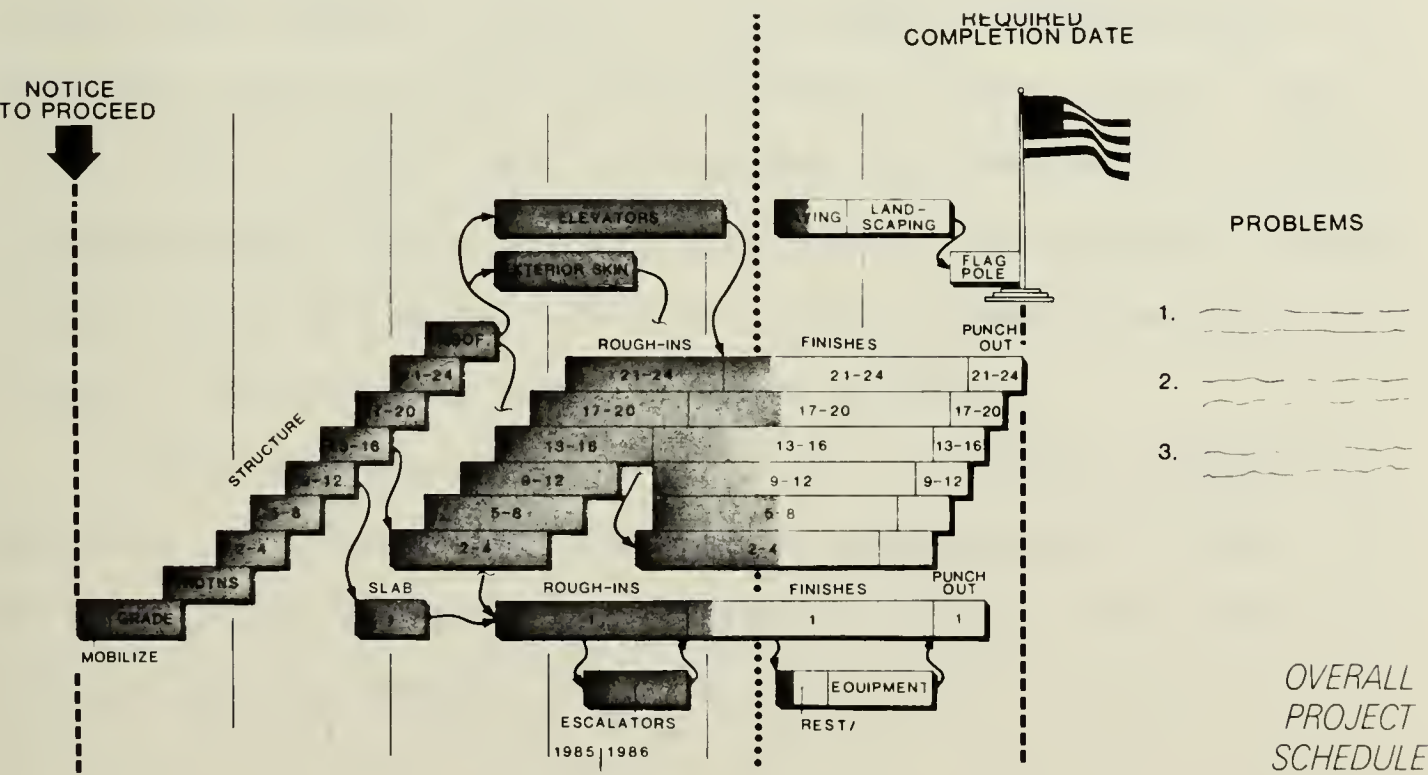
#	ACTIVITY	D D	U A	O	WEEK NUMBER											
					1	2	3	4	5	6	7	8	9	10	11	12
1	excavate footings	4.5	S	+++												
			A	****												
2	foundation	4	S	++++												
			A	****												
3	under slab utilities	1	S	+												
			A	*												
4	slab	3	S	+++												
			A				***									
5	frame	10	S				+++++									
			A				*****									
6	exterior walls	16	S				+++++	+++++								
			A				**									
7	roof	3	S								+++					
			A													
8	rough utilities	7	S								+++++					
			A													
9	interior finish	20	S								+++++	+++++	+++++	+++++	+++++	+++++
			A													
10	finish utilities	4	S												+++	
			A													
11	paint	10	S												+++++	
			A													
12	landscape	3	S												+++	
			A													

Figure (3B)





The need for activity interdependencies and project revision resulted in the development of what is commonly known today as summary bar charts. Summary bar charts break down the project into greater detail and show the interrelationships of activities as shown below. To allow for better project monitoring and control the bar charts are then revised monthly or bi-weekly using "near term" schedules. Using the near term schedule, which is a product of progress meetings, the project superintendent or manager can control the necessary resources to bring the project back on schedule. See appendix (A) for an example of an actual near term schedule as prepared by DRAPER AND ASSOCIATES.





The summary bar chart is much more time consuming in its preparation than a Gantt chart but its usefulness is also much greater. To offset this drawback, many of the firms that the author interviewed used a computerized version of the summary bar chart. This provides for quick analysis and updating of the schedule. Additionally, several of the summary bar chart software programs have their own computer aided design (CAD) modules or interface with a CAD program allowing for the quick and professional drafting of the bar charts. These computer capabilities will be discussed further in section 3.5 of this paper.

### 3.2.3 THE CRITICAL PATH METHOD (CPM)

The development of the critical path method (CPM) is a result of research done in the 1950's by James Keller of Remington Rand Univac and Morgan Walker of the DuPont Corp. (5). Their goal was to develop a computerized based technique which could be used to schedule and monitor large construction projects. Out of their research came what is commonly called today the I-J method of CPM.

Furthering the research of Keller and Walker, Fondhal of Stanford developed the activity-on-node version of CPM, or what is called the precedence method. Let us first take a look at the I-J method.



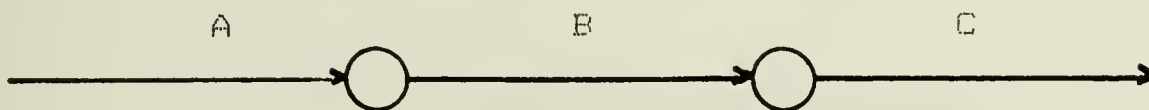
In this method each arrow represents one activity in the project. The tail of the arrow represents the start of the activity and the head represents the completion.



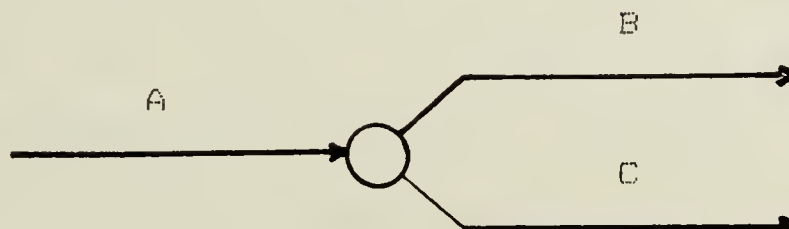
Note that the arrow is not a vector and thus need not be drawn to scale. Curving or bending of the arrow is allowed as long as it is not interrupted.

The project network is then developed by arranging the arrows in a logical sequence based on the interdependencies of the activities. There are a number of logic rules which are useful when preparing a network.

1. If activities A, B, and C occur in series, their network would look like this:



2. If activities B and C are independent of each other but both are dependent on the completion of A, then the network would look like this:

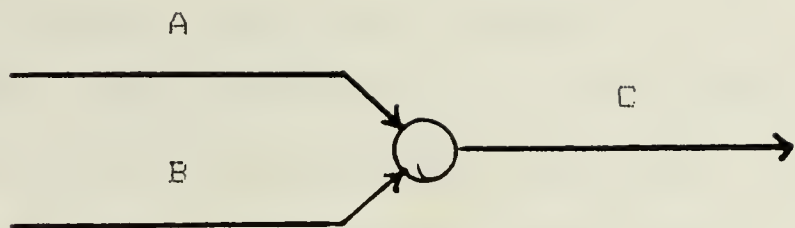


This is called a burst node.

3. If activities A and B are independent of each other but both precede the start of activity C, then the network

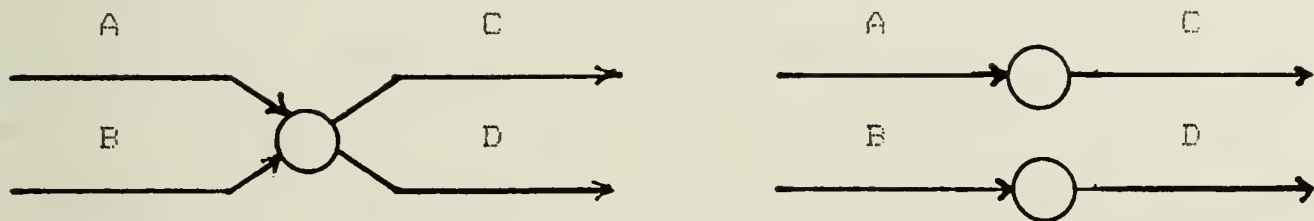


would look like this:

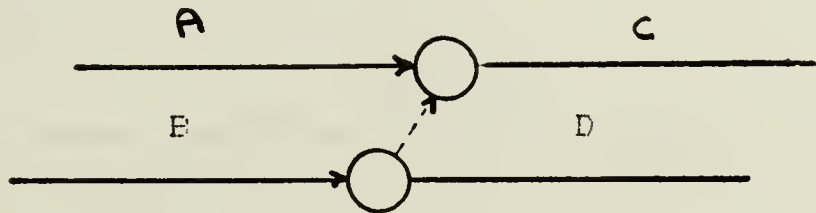


This is called a merge node.

4. Because arrows can not be broken up or forked, a problem occurs whenever a situation like the following exists. A and B precede C, B precedes D. A and B are independent, C and D are independent. Several examples of the incorrect network are shown below:



By introducing a logical constraint call a " dummy activity", which represents logic flow but no work, the above can be represented as follows:



The subsequent development of an entire network can be accomplished using these simple techniques. Once the network is completed and checked for logic, the numbering of the nodes and listing of the activity durations can be done. Node numbering is done by working from top to bottom, left to right, and the durations are listed under the arrows.

The subsequent calculation of the project's duration, the determination of the critical path, and the

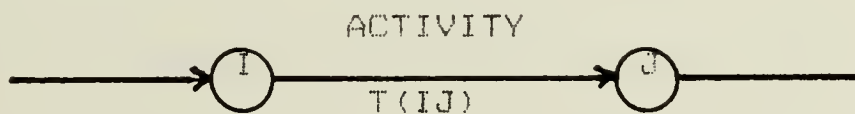






identification of scheduling leeway are then found by performing forward pass and backward pass calculations. Forward pass calculations supply the earliest times for the start and finish of the activities and also the total time necessary for the completion of the project (4). Backward pass calculations give the latest times for each activity's beginning and ending. The amount of leeway for the activities results from the manipulation of the values from the forward and backward pass.

Before expanding on the mechanics of the forward and backward passes, let us take a look at the basic notation of I-J networks. Below is a figure showing a typical activity. Node I represents the start of the activity and node J represents its completion.  $T(IJ)$  is the activity's duration, either in days, weeks, hours, minutes, or whatever, as long as the same units are used throughout the network. The activity's description is obvious.



Associated with each activity on the time scale are four values which can be identified as follows:

ESD(IJ)--Early start date for activity I-J

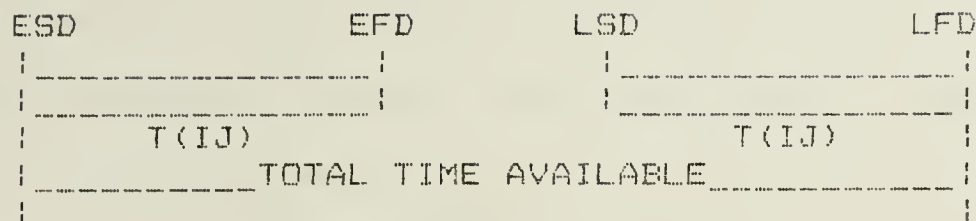
EFD(IJ)--Early finish date for activity I-J

LSD(IJ)--Late start date for activity I-J

LFD(IJ)--late finish date for activity I-J

Their relationship with respect to activity I-J is shown at the top of the next page:





The purpose of the forward pass is to calculate the project's duration and to establish the earliest possible start and finish date for each activity. A common procedure in doing this is to start at the beginning of the project and to sum the individual activity durations along a chain until a merge node is found. At the merge node the largest value of the sum of the activity times from each path entering the node is taken as the start of the succeeding activities (4). The EFD is then found by adding the activity duration,  $T(IJ)$ , to the ESD. This can be expressed in equation form as:

$$EFD(IJ) = ESD(IJ) + T(IJ)$$

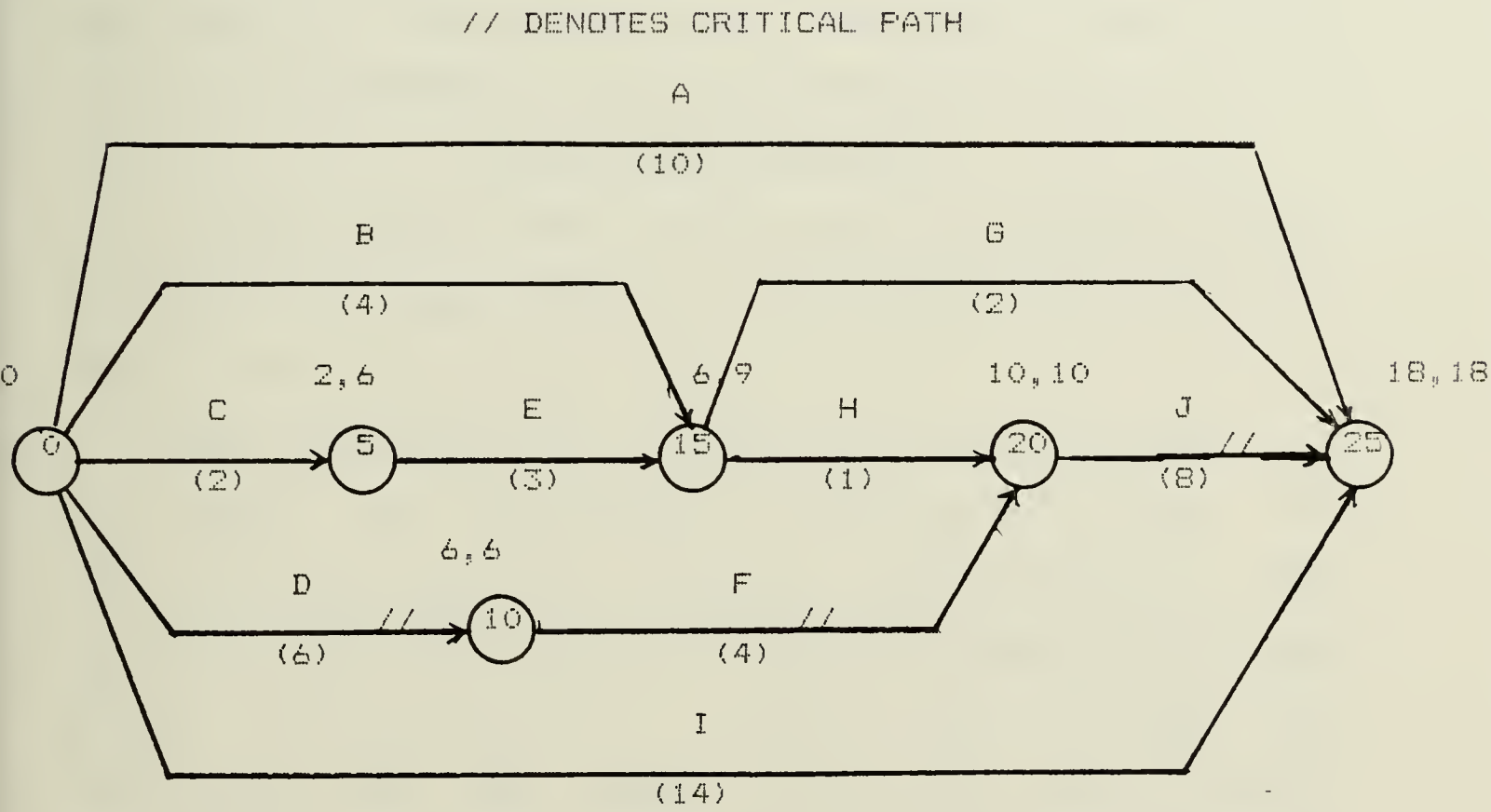
The purpose of the backward pass is to find the latest possible start and finish times of each activity such as not to delay the completion of the project. This is done by starting at the termination of the project and finding the path with the longest duration back to the initial node of the project. The calculations are started by assigning a late finish date, usually the desired completion date of the project, to all the activities merging at the last node in the project and then successively subtracting activity durations along chains of activities until a burst node is found. At the burst node the smallest value of the late starting dates calculated for each path leaving that node is



taken as the late finish date for all activities that enter the burst node (4). The  $LSD(IJ)$  is then found by subtracting the activity duration,  $T(IJ)$ , from the  $LFD(IJ)$ . This can be expressed in equation form as:

$$LSD(IJ)=LFD(IJ)-T(IJ)$$

An example network and the calculation of the four activity times, ie, ESD, EFD, LSD, LFD, is shown below:



EXAMPLE CPM NETWORK



The determination of the critical path and the calculation of scheduling leeway (float) is then accomplished by manipulating the above four activity times. There are four types of float, of which only one, total float, will be discussed here. For additional information on free float, interfering float, and independent float, see appendix (B). Total float may be defined as:

That time span in which the completion of an activity may occur and not delay the completion of the project.

To calculate the total float the earliest an activity can finish is subtracted from the latest it must finish, which can be expressed in equation form as:

$$TF(IJ)=LFD(IJ)-EFD(IJ)$$

To then identify the critical path an examination of the activities is made and those activities in which the total float is zero are critical.

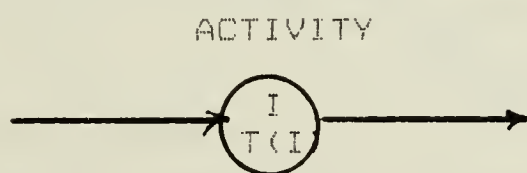
Summarizing the above we discussed the construction of the network, the calculation of the activity times, the calculation of total float, and the determination of the critical path. With this information a project manager can monitor the progress of a project and through the manipulation of the network know what effect delays, suspensions, and additional work will have on the completion of the project.





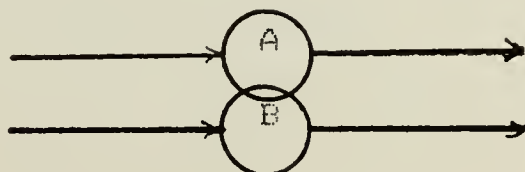
As previously mentioned, the precedence method of CPM was developed by Professor John W. Fondhal of Stanford University in 1961 (4). Fondhal based his scheduling technique on the theory that activities or events could be represented by nodes, with the links establishing the relationships between the respective activities. This resulted in several advantages. The most apparent is that dummy arrows are no longer required. Second, the hand calculation of activity times was easier.

In the precedence method an activity is represented by a description and a corresponding node number. The shape of the node can be a circle, square, hexagon, or whatever is convenient to the scheduler. An example of an activity is shown below:



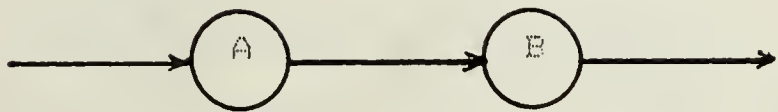
The construction of the precedence network is similar to that of the I-J method, in that there are independent, dependent, merge, and burst nodes. Examples of each are presented below:

1. If activities A and B are independent of each other their network will look like:

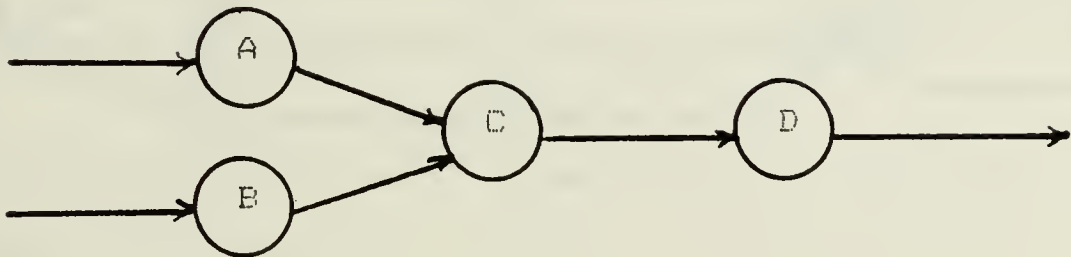




2. If activity B is dependent on activity A, their network will look like:

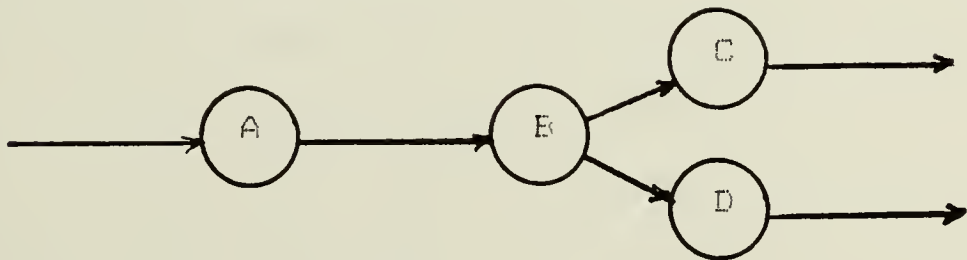


3. If activity C is dependent of both activities A and B, and activity D is dependent on activity C, their network will look like:



This is called a merge node.

4. If activities C and D are independent of each other, but are both dependent on activity B, which is dependent on activity A, their network will look like:



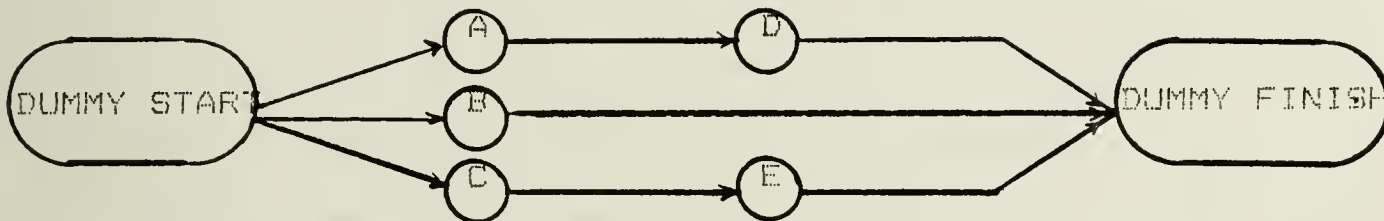
This is called a burst node.

The scheduler then constructs a network in basically the same manner as when using the I-J method. However, a logic problem arises when several independent activities can start at the beginning of the project or when several independent activities have no follow-on activities at the completion of the project. A situation like this might be represented as shown on the top of the next page:





To correct this the scheduler inserts a "dummy start" and a "dummy finish" at the beginning and end of the project network, which can now be redrawn as follows:



The dummy start and finish activities have no duration but are necessary to close the network and to allow for the computation of the activity times and float.

As in the I-J method there are four activity times that each activity can have:

ESD(I) -- Early start date for activity I

EFD(I) -- Early finish date for activity I

LSD(I) -- Late start date for activity I

LFD(I) -- Late finish date for activity I

The scheduler will usually assign the value of zero to the ESD of the initial activity and then calculate the EFD of that same activity by adding the activity duration,  $T(I)$ , to the ESD. This can be expressed in equation form as:

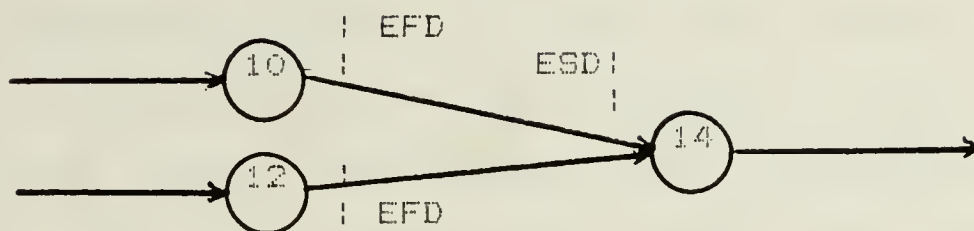
$$EFD(I) = ESD(I) + T(I)$$

The ESD for following activities is found by taking the maximum or latest EFD of all preceding activities which terminate into that particular node. An expression for this



is provided below along with an example:

$$ESD(J) = \text{Max (over all I)} [EFD(I)]$$



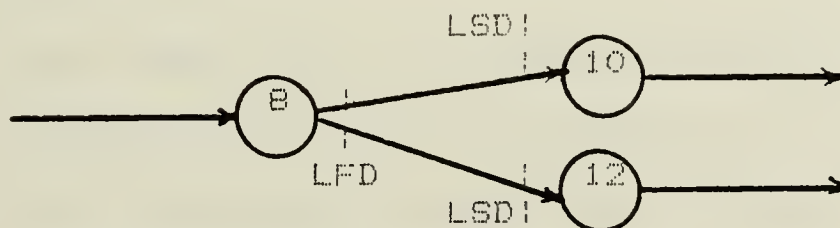
The expression above can be read, the early start date for activity J is equal to the maximum or latest finish date of all activities I which precede activity J. This procedure is then performed throughout the entire network.

In the same manner as done with the ESD of the first activity, the scheduler will usually assign the LFD to the last activity. This is usually the same as the EFD for the terminal activity and is also normally the desired completion date for the project. The LSD for the terminal activity is then found by subtracting the duration of that activity from the LFD. This can be expressed as follows:

$$LSD(t) = LFD(t) - T(t)$$

The LFD for the other activities of the network is dependent upon the LSD of its following activities. An expression for this is provided below along with an example:

$$LFD(I) = \text{Min (over all J)} [LSD(J)]$$



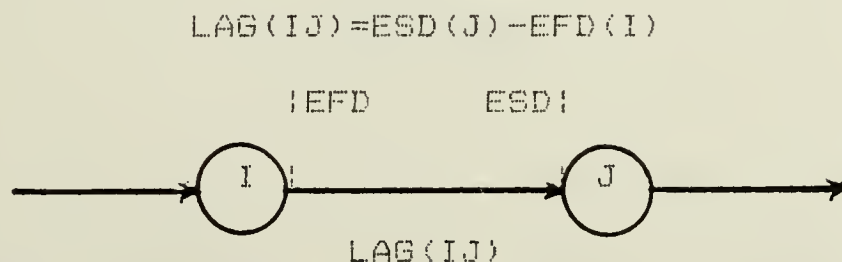
The expression above can be read, the late finish date for activity I is the minimum late start date for all





activities J which follow activity I.

Upon completing the calculations of the four activity times the scheduler can then calculate the values of the float, of which, just like the I-J method, there are four types, total, free, interfering, and independent. This paper will deal only with total float. For additional information on the other types of float the reader is directed to appendix (C). In addition to finding the float, the scheduler can determine the value of the "link lags", which are unique to the precedence method. A link lag may be defined as the difference between the early start date of an activity and the early finish date of the preceding activity (4). An expression for this is provided below along with an example:



Each link in the network will have a lag of which the value will always be zero or greater. The values of these lags are the basic values to be used for the determination of the floats (4).

The total float (TF) of an activity can be defined as:

The time span in which the completion of an activity may occur and not delay the completion of the project.

The development of the equation used to calculate the TF for an activity I is extensive and is contained in appendix



(D). The final equation is shown below:

$$TF(I) = \text{Min (over all J) } [LAG(IJ) + TF(J)]$$

The expression above is read, the total float for activity I is equal to the minimum summation of lag and total float for all following activities J.

The critical path is then determined by examining the TF for all activities in the network. Any activity which has a TF equal to zero, or in the case where the terminal activity's TF does not equal zero where the activity's TF equals the terminal activity's TF, is a critical activity. And the chain of critical activities extending from the initial activity to the terminal activity is the critical path.

### 3.3 DURATIONS

Once the logic of a network has been completed and before the calculation of the four activity times and floats, there remains the determination of the activity durations. As noted before the scheduler will choose the units of the time scale to fit the project. The only important rule here is to be consistent with the units throughout the entire network.

In determining the activity durations the scheduler will take into account the influence the following factors will have on the activity:

1. The magnitude of the work content involved in the



work task.

2. The extent to which equipment will be used in completing the activity.

3. The extent to which labor will be used in the work task.

4. The physical environment of the work site, working conditions, shift hours, weather, etc.

5. The level and efficiency of management of the foreman and at the work site.

Depending on the relative magnitude and mix of these factors, activity duration estimates may be deterministic, probabilistic around a mean, or almost completely random (3).

Deterministic durations assign a specific fixed value to the activity duration. This method is the method used in each of the scheduling techniques discussed to this point. The scheduler will assign a specific task duration to each activity based on one or more of the following techniques:

1. Past experience. The agents involved in the work process know the time required by frequent past experience on identical or similar jobs of the same magnitude.

2. Estimates. Planning and estimating agents obtain data from previous work on similar jobs. This data enables them to establish productive rates as a function of the size and mix of resources allocated to the activity.

3. By fiat. By an initial trial or mock up run on the operation.

4. Use of predictive models. Often the basic components



of an operation are known and the productivity of resource units working these components is also known. Given situations where the relative magnitude and mix of the basic operation components change, predictive models of productivity and duration estimates are very useful and practical (3).

The scheduler then inserts these activity durations into the network and computes the four activity times, the floats, and identifies the critical path using the method appropriate for the respective scheduling technique.

#### 3.4 APPLICATIONS OF CPM

The uses of CPM are not limited to project scheduling and monitoring. The experienced and knowledgeable scheduler can and will use the CPM developed for a project to:

1. Prepare utility data and time-cost curves for activities.
2. Perform simple and complex compression or decompression of the project schedule to arrive at the most economical means by which to complete the project.
3. Level resources using float times.
4. Perform financial planning and cost control.
5. Evaluate the impact of work changes and delays.
6. Control the project as a whole and bring it in on time and on budget.

This paper limits itself to number 5 above, the







evaluation of the impacts of changes and delays. For the reader to fully comprehend the power of CPM he should familiarize himself with all the capabilities of CPM. A list of references is provided in the bibliography for the reader who wishes to further his knowledge in this area.

### 3.5 AUTOMATED METHODS OF SCHEDULING

For small projects, say under 100 activities, the scheduler can complete the calculations of the activity times the floats, and identify the critical path by hand. However, as the size of the project grows so does the network until there comes a point in time where hand calculations are no longer practical. The network, when it gets over 200-300 activities, can become such an unmanageable monster that the time and effort required to update the network, revise the logic as necessary, and recalculate the activity times does not prove cost effective. This problem has often been the reason for project managers tossing the CPM network into the corner and completing the project using "crisis management".

However, with advances in the computer industry, in both hardware and software, this no longer needs to happen. Personal computers (PC's) and mainframe computers have become more advanced, compact, and readily available. Today, even the smaller construction firms can afford to buy or lease PC's which are capable of supporting software programs which can perform scheduling work, resource leveling, financial



planning, or almost any task associated with managing a project. Larger firms which deal with many projects at a time, some having 10-15,000 activities each in their networks, may use mainframes to store and manipulate the huge amounts of data that such projects generate.

The availability and capability of both the hardware and software to perform the tedious tasks associated with monitoring a project has also proven useful in the analysis of claims. Using a CPM scheduling program a contractor can easily update the project status and have a current revised schedule printed out quickly, providing him with a record of how the job was actually built. This is particularly useful when delays, changed or added work, or suspensions have occurred. The contractor can use the updated schedules to determine what affect a particular delay had or will have on other activities. In addition to quantifying delays which have already occurred, the contractor can also use the CPM scheduling program as a preventive management tool, which is its primary purpose. By playing what if? games with the network, the contractor can review several different options of the network for the remaining work and choose which will complete the project in the shortest time or for the least cost.

Which scheduling software program to use and what computer to buy are questions that each company must ask and answer itself. Appendix (E) of this paper contains some suggested guidelines which can be used in addressing the



matter of procuring the computer hardware. Additionally, appendix (F) provides a list and description of approximately 104 project management programs which are available on the market today, of which 64 deal specifically with scheduling.

### 3.6

### PERT

#### (PROGRAM EVALUATION AND REVIEW TECHNIQUE)

Before leaving this section on project scheduling, let's take a look at a scheduling technique that unless the contractor has been associated with a research and development contract he may not be familiar with.

PERT (Program Evaluation and Review Technique) was developed in the late 1950's to review the huge Polaris missile development program. Its use in the scheduling and monitoring of construction projects has not caught on yet and it is very limited today. However, for large projects which are using futuristic or never tried before methods of construction PERT may not only be a useful scheduling tool but it may also be required if the contract is with the Federal Government.

PERT is based on four elements (6):

1. The selection of specific identifiable events that are planned to occur along the way to successful completion of the project. These events are commonly termed milestones and subsequently PERT is event oriented.

2. Link the planned events so as to graphically portray the interdependencies among them. This results in a network





similar to a CPM precedence network.

3. Estimate the time necessary to move from event to event with a measure of uncertainty involved. Because the work has never been accomplished before, deterministic estimates are not available for the duration between events. This is the main difference between PERT and CPM. To estimate these durations PERT uses 3 time estimates:

A) The most likely,

B) The most optimistic (best or shortest under the known conditions).

C) The most pessimistic (worst or longest under the known conditions).

With this input PERT then calculates the expected duration between events and also calculates the expected variance from this expected event duration.

4. Perform an analysis based on the event durations and their variances which will systematically highlight the relative criticality of the events (6).

The final product of a completed PERT network is not any one project duration or critical path, but a listing of possible project durations along with a confidence interval indicating with what certainty that that duration may occur. Additionally, the relative possibility of a particular path of activities being critical is provided.

Many of the scheduling programs now available on the market will also support PERT. Once mastered, PERT is a very useful tool when dealing with new construction techniques for which duration estimates are unknown.





## 4.1

## INTRODUCTION

Up to this point this paper has looked at some of the most common causes of schedule deviation and how they might affect a construction project by either increasing and/or decreasing a project's cost and duration. This paper also reviewed several popular methods of construction scheduling, taking an in-depth look into the most widely used method, CPM. This paper listed some of the applications of CPM and discussed how the computer has made CPM a powerful cost effective management tool. In this section this paper will take a detailed look at how schedule deviations are made part of the original network and how their impact is subsequently analyzed. Understanding the particulars of this process is essential to correctly analysing a claim. Before a schedule deviation can be analyzed, the scheduler, contractor, lawyer or owner must fully understand how to revise existing schedules to correctly reflect how the work was actually done.

## 4.2

## THE ORIGINAL SCHEDULE

Whenever a project is planned and controlled by network analysis, the contractor's original network program depicts the basis on which the contractor determined the price and time for the work (2). This original network, if accepted by the owner and thus made a part of the contract, establishes



not only milestones and target dates for the contractor but also for the owner. Any events, whether they are caused by the owner, the contractor, or a third party, which force a deviation from this network then constitutes a change in the contract (2). Once a deviation has occurred, the comparison of the revised network with this original is the basis for the determination of all resulting delays. Although only those activities which are on the critical path determine the project's duration, delays which exceed the float on non-critical activities can result in a new critical path. Therefore, the determination of all delays, critical or otherwise, can be accomplished by a network analysis. The subsequent costing of these deviations is then based on the actual time impact to these deviations.

#### 4.3

#### THE AS-BUILT SCHEDULE

The as-built schedule is a record of the actual sequence and duration of work activities to date. The importance of maintaining an accurate and up to date as-built schedule can not be overemphasized. When kept up to date a schedule identifies not only those areas where inaccurate estimates or nonproductive crews have caused longer than planned activity durations, but also it can be used to identify delays and or changed work and their impacts on the project duration.

To keep a schedule updated is a continuous operation which requires the flow of factual information from the field



to the main office and back again. The field personnel, the superintendent or the foreman, must provide activity status reports on each activity in progress to the scheduler estimator. The form of this report can be tailored to the particular job and type of work. An example of such a report as published by Antill and Woodhead in reference (2) is shown below.

## Daily Critical Operation Summary-Weekly Statement

Contract ..... Contract No. .... Project Day Number ..... Date .....

<u>Daily</u>	Project Manager	<u>Additional</u>	Area Manager	<u>Additional</u>	Managing Director
<u>Circulation</u>	Area Planning Dept.	<u>Weekly</u>	Group Planning Manager	<u>Monthly</u>	
		<u>Circulation</u>	Area Estimating Dept.	<u>Circulation</u>	

### Operations Overdue for Start or Within 5 Days of Latest Start Date

Nodes		Operation Description	Days Before Latest Start Date	Critical Days Lost	Skill Code	Critical Man/Machine Days Lost	Reason for Being Behind Schedule	Action Being Taken To Recover Lost Critical Days	Agreed Action
I	J								
								Project Manager's Signature .....	Area Manager's Signature .....

#### 4.4 DEVELOPING THE AS-BUILT SCHEDULE AFTER THE FACT

Keeping the project schedule updated is a very tedious and often time consuming task. But by doing so the contractor not only creates a record of the project which is vital in settling claims, but the contractor is also forced





to examine the project on a regular basis and this in itself will help the project manager in keeping in touch with the status of the project. This helps the contractor in identifying problem areas which may be occurring which otherwise may go unnoticed. But what if the contractor does not update the schedule after the first month or so of the project and at the completion of the project the contractor feels justified in submitting a claim? What would be used to compare to the original schedule? Unfortunately, this is not that uncommon an occurrence.

To assemble an as-built schedule after the work is completed can be done in several ways but the most common used method is to reconstruct the project step by step using jobsite and office records. There are eight critical sources of information which should be reviewed to obtain the necessary data to rebuild the project. These sources are:

1. The jobsite project plans and specifications. These can usually provide a running account of all revisions and changes made to the original plans and specifications.

2. Shop drawing and transmittal status logs. The status logs can provide the reviewer with the date of submission and approval of required shop drawings and transmittals. These dates can then be used as evidence of why certain portions of the project were delayed in starting.

3. Any interim updated schedules. Interim or marked up schedules along with progress meeting minutes can often be used to establish the status of activities throughout the life of the project.





4. Daily jobsite log. Perhaps the most valuable source of information if prepared correctly. From the jobsite log the following information should be available for each work day of the project:

- work performed
- work scheduled but not done
- extra work required (including details of why it was required and who authorized it, any delays which might arise out of the work and any identifiable costs)
- discrepancies in the plans and specifications
- site visits by owner's representatives, A/E, etc
- weather
- unusual events
- manhours and equipment hours expended (7)

5. Photographs. Can show the status of the project or any part of it on a particular day.

6. Correspondence. Change order proposals, notification of discrepancies in the plans and specifications, requests for clarification, directives from the owner, can all be tied to identifiable activities and the date of the letter can then be used to establish the possible time frame for the activity.

7. Cost codes for delays or changed work. If the contractor uses a separate cost code to identify additional work, these cost codes in conjunction with the time cards can be used to pinpoint when and how much any additional work or delayed work cost.



8. Time cards. By reviewing costs codes and time cards and comparing them to the quantity of work put in place at a particular time the efficiency of particular activities can be determined and it can be used in justifying disruption claims.

For a project of any magnitude the review of the project records can be a formidable task. The above documents can easily number in the thousands and the time required to assemble the as-built schedule could take weeks if not months. One of the firms the author interviewed specializes in claim analysis. They have developed a software program to streamline document review and control, the program is called Document Control and Retrieval System (DCRS). To use DCRS, the analyst inputs into a database a brief summary for each document using key words to identify the subject of the document. For example, a letter from the contractor to the owner forwarding a change order proposal for unseen site conditions, say rock located in the southwest corner of the excavation which was not shown on the plans, may be entered as: letter: dtd 1Jul19xx; fm: contractor; to: owner; subj: change order proposal, unseen site condition, rock, southwest corner. Once this is done for every document the analyst can then retrieve automatically a listing of all documents which pertain to a certain subject. This is useful when in the presentation or rebuttal of a claim a topic is brought up for which research had not been done. See appendix (G) for a brochure on DCRS.

The information from these reports is then transferred



to the network on a regular basis, either weekly or bi-weekly, or maybe even daily on a fast moving three shift project. If all activities are on schedule no remedial action needs to be taken. However, if some or all of the activities are behind schedule, the network activity times are recomputed using the CPM scheduling program and the projects new duration and critical activities are identified. Based on this new information upper management can take two courses of action. The first course of action is to recover the original schedule by manipulation of available resources within the present network concept (2). The reallocation of resources is analyzed with respect to time and money and if found satisfactory the project can proceed under the revised schedule. If the new completion date is not satisfactory, the compression or crashing of critical activities may be required to bring the project back on schedule.

The second course of action is to completely redesign the network for the remaining work. This may include new work methods, different equipment or additional resources (2). The new network can be costed out and if the new costs and project duration are satisfactory the project can proceed in accordance with the revised network.

There are several methods by which to revise the original schedule and thus create the as-built schedule. This paper will present the basics of three of these methods.

#### 4.5 DEVELOPMENT OF THE FACTUAL NETWORK





The development of the as-built schedule, or factual network as it is called in some circles, is the basis for identifying all changes in the work and delays that the project experienced during its progress. When assembling the as-built network there are three means by which the changes of work or schedule deviations can be made a part of the network. They are:

1. As new activities.
2. By coding existing activities.
3. By inserting parallel or phantom activities (fragnets).

To illustrate each of these methods look at the network shown in Figure (4a).

The critical path is made up of activities 5-40, 40-65, 65-75, and 75-80, and the project's total duration is twenty seven days as defined by this critical path. For the purpose of this example the project is going as scheduled until the contractor reaches activity 10-15, when a discrepancy is noted in the plans. This results in a three day delay waiting for clarification from the A/E, and adds two days to the duration of the activity because extra work is required. The contractor subsequently declares he was delayed five days and submits a change order for the extra work in addition to a claim requesting a five day time extension. The owner denies the request for a five day time extension, saying that the contractor is due only two days for the additional work, because activity 10-15 is not on the critical path.

Note that when analyzing or updating a factual network





it is often convenient to use a time-scaled network. This allows the analyst to quickly see the impacts of delays and disruptions. Figure (4a) has been converted to a time-scaled network in Figure (4b). Time-scaled networks also enable float calculations to be avoided since they are displayed as horizontal dashed lines (2). This method of drawing networks will be used throughout the rest of this paper.

Using method (1) a new activity, activity 10-12 titled "delay #1", with a duration of three days, is inserted into the network. Additionally, a new activity, activity 14-15 titled "change order #1", with a duration of two days, is inserted in the network. The scheduler then adjusts the start and finish dates for the follow on activities. The revised network is now as shown in Figure (4c).

Applying method (2) to this situation requires the coding of activity 10-15 to show a three day delay titled "delay #1" and then increasing the duration of the activity by two days. The scheduler would then adjust the start and finish dates of the follow on activities in the usual manner. The revised network is now as shown in Figure (4d).

Applying method (3) to this situation requires the insertion of the actual logic as a parallel activity to the original plan of work. Activity 10-5000, titled "delay #1", with a duration of 3 days, and activity 5000-15, titled "activity H and change order #1", with a duration of 7, are inserted as concurrent activities to activity 10-15. The scheduler would then adjust the start and finish dates of the follow on activities based on the longest path of these



concurrent activities. The revised network is now as shown in Figure (4e).

The results of each of these three methods is the same, ie, the impact of the additional work and the delay was calculated as the same. The scheduler may choose any of the methods based on his personal preference or he may use a combination of all three. In this example, as can be seen on the time-scaled networks, the contract has been extended four days. Two of these days are for the additional work, and two of the days are a result of the delay, for which the contractor can claim for extended overhead..

The author prefers to use methods 1 or 3, but preferably method 3. The reason for this is because the new parallel path is portrayed directly above or below the planned schedule. This proves to be very useful when presenting the claim to others. Using a time-scaled network the additional time required to perform the new sequence of work will cause the original activities' float to increase. Even to the casual observer this increase in float is easily identified as the amount of delay the owner or contractor incurred. Additionally, method 3 does not require the rearranging of the existing network, only the addition of a new parallel path. This is convenient when the schedule is being run on a computer. The computer operator will only have to change the dependencies of the finish node where the new parallel path re-enters the original network. An added bonus is that the individual delays and any additional work will be listed as such on both the new network and the printout of activities.



Method 1 also provides these same benefits except that the computer operator will have to revise the logic of the schedule in the program as new activities are added into it. This will require the renumbering of nodes and may result in an error in the logic of the revised network.

Method 2, the coding of existing activities, although effective, does not offer the potential presentation benefits of the other methods. One advantage however, it does not require logic revision and therefore eliminates the possibility of such errors in updating.



// DENOTES CRITICAL PATH

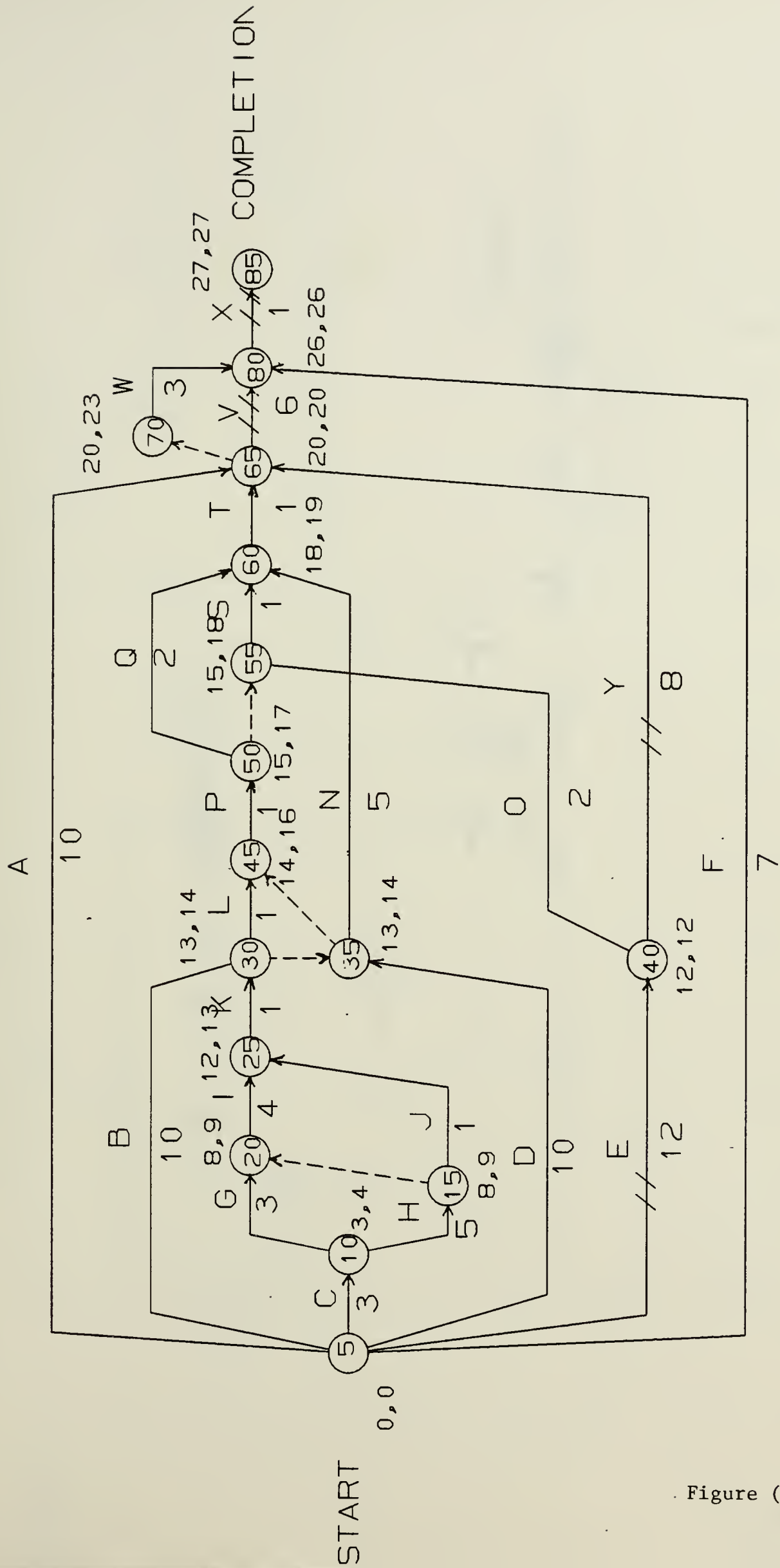


Figure (4A)

ORIGINAL CPM FOR PROJECT





PROJECT COMPLETION

TIME SCALE IN DAYS

TIME-SCALED NETWORK OF ORIGINAL CPM

Figure (4B)



// DENOTES CRITICAL PATH

NEW ACTIVITIES

PROJECT  
START

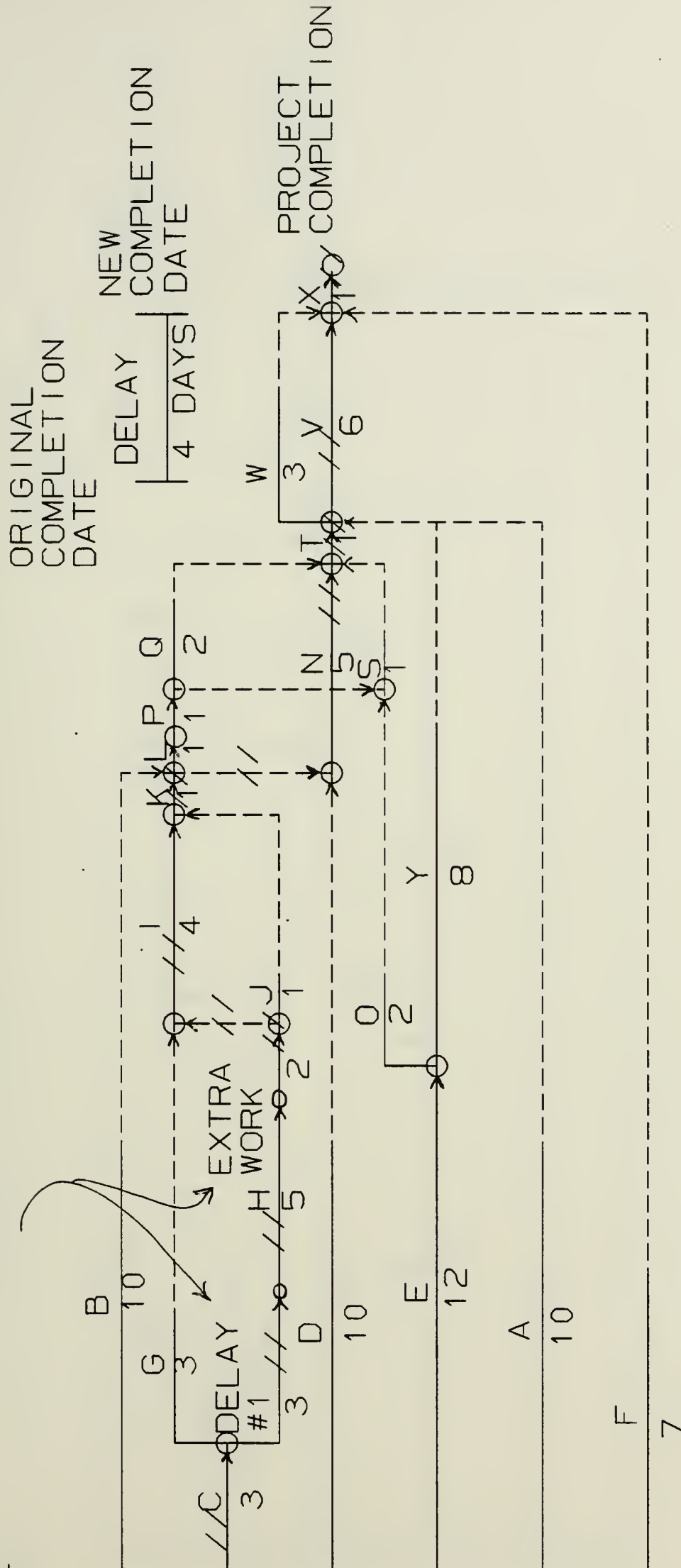
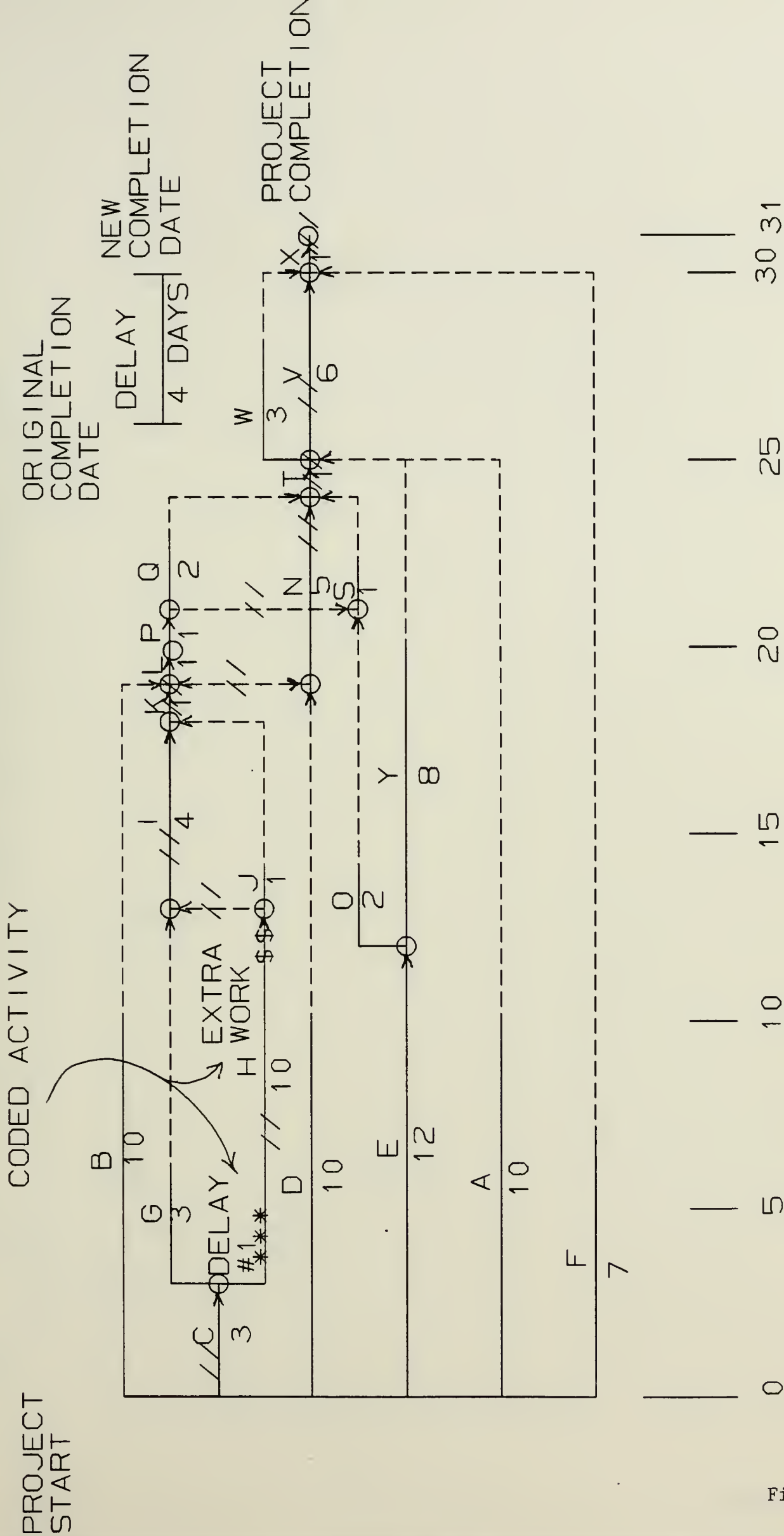


Figure (4C)

TIME-SCALED NETWORK SHOWING NEW ACTIVITIES



// DENOTES CRITICAL PATH



TIME-SCALED NETWORK SHOWING CODED ACTIVITY





H1 IS THE ORIGINAL TASK  
PLUS THE 2 EXTRA DAYS WORK

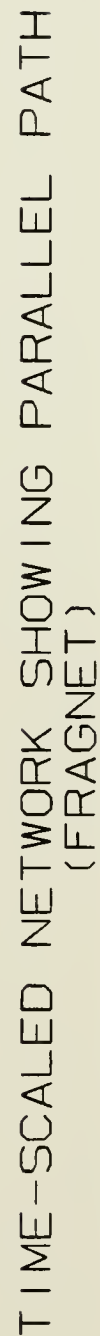


Figure (4E)



## 5. SETTling THE CLAIM

### 5.1 INTRODUCTION

Once the facts have all been assembled and the contractor or owner is ready to present their case they need to consider carefully by what means this is going to be done. The contract may state explicitly how a claim is to be handled. For example, Federal construction contracts call for a review by the Contracting Officer who will hand down a final decision. If the contractor disagrees with the decision the contractor may appeal to the Armed Services Board of Contract Appeals (ASBCA). Some commercial contracts will set forth guidelines which establish the A/E as an arbitrator. And still others will call for an unbiased negotiator, with the right to appeal to a civilian court.

Whichever method is used the parties must remember that the purpose of the claim is to compensate the damaged party, returning them to the same position they were in before the cause of the claim occurred. Theoretically, the facts of the claim will speak for themselves and the final settlement should be fair and reasonable for all parties involved. But often this is not the case.



If the claim is pursued through litigation and ends up in court the case may be presented in a jury trial or bench trial. In such a trial the jurors or judge most likely will not be familiar with construction delays, the costly impacts of such, scheduling, or CPM. Their final decision subsequently may be based on not who is technically right but who they believe to be morally right. This can be equated to the "deep pocket theory". On the other hand, if the case is presented in such a manner where the jurors or judge can decipher the facts, ie, the expert witness can communicate with them, and the charts or schedules which the jury or judge examines are such that the delays are easily identifiable, then the jury may render a fair and reasonable decision.

This lack of construction knowledge among the judge and jury highlights the importance of the method by which a case is presented. Whether the parties are before a jury trial or a bench trial the lawyers and expert witnesses must remember that if their presentation is too complex, too technical, that the jury or judge may miss some of the facts and award to the wrong party. During the author's research the ten firms were all queried as to whether they preferred a jury of the public or a jury of experts, ie, people with considerable knowledge and experience in scheduling, CPM, and construction. In almost every case the answer was qualified.



If the case was very complex, where evidence of multiple causes and effects, compression, concurrent delays, efficiency studies, etc, were to be presented and the claim was strictly a review of the facts, almost all interviewed would prefer a panel of experts. Their reasoning was the experts would be able to decipher the facts and base their decision on them. There were however, some who disliked expert juries because sometimes their background was a source of prejudice. They explained that an expert juror may have developed a dislike for a particular trade during their career, and that this prejudice would carry over into the courtroom.

If the case was not too complex and there was an issue of where a contract requirement was not technically met, ie, the notice of a claim was given after 35 days instead of the required 30 days, but all the facts show that the contractor is due compensation otherwise, in almost all cases the interviewees said they would prefer a jury of the public.

### 5.3 ALTERNATIVES TO LITIGATION

Whoever is submitting the claim however, must realize that the legal process is very time consuming and costly. At present it takes from six months to two years to get a claim into court and get a settlement. The eventual award could easily be eaten up by legal fees. Several of the firms interviewed stated that the best way to settle a claim is before it happens. If the owner knows the plans are wrong or







## 6. SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

### 6.1 SUMMARY

The objective of this paper was to provide the reader with a basic understanding of the many factors involved in delay claim litigation. Upon completing this paper the reader should be familiar with each of the following and how each plays a role in construction delay claims:

(A). The five primary causes of schedule deviation: delays, disruptions, acceleration, suspension of work, and constructive changes. This paper discussed how to recognize each of these causes and what rights and responsibilities that each party has with respect to each cause.

(B). Five types of scheduling techniques used in the construction industry today, Gantt charts, summary bar charts, CPM (both the I-J and precedence methods), and PERT. This paper discussed the development of each of these methods and the advantages and disadvantages of each. Because of its popularity a more in-depth review of the CPM method was provided. Also the paper discussed the potential applications of CPM and that advances in the computer industry has made CPM an even more powerful tool.

(C). How schedules are updated and how the impacts of delays are calculated. This paper discussed three techniques used to do this, 1) adding new activities into the network; 2) coding existing activities; and 3) using parallel or phantom paths. Additionally, this paper discussed the importance of updating a schedule and what records to keep to



do this properly.

(D) Some of the possible drawbacks associated with taking a claim to litigation. This paper discussed some of the benefits of settling a claim early and the problems which may arise from going to court.

An entire book could be written on each of the topics above. However, it was the results of the interviews that convinced the author that the understanding of not one, but all four of the topics was paramount to being in a better position to settle construction delay claims. Thus the decision to write a broad yet comprehensive review of construction delay claims was made. In the next section the author presents the conclusions drawn from the interviews.

## 6.2

## CONCLUSIONS

In researching for this paper the author interviewed five construction law firms and five construction management firms. The reason for this was to get a feel for the state of the construction industry today with respect to delay claims. The questions ranged from the technical to the philosophical. The responses to the questions were diverse yet they all in some way or another supported the theme of this paper, that is, that claims would be settled quicker and easier if everyone involved had a better understanding of what causes claims, and how they are settled.

All the questions and responses can not be repeated here because of their length. However, the author has condensed



them into seven conclusions which summarize the philosophy of most of the individuals interviewed, and subsequently the philosophy of this paper:

1). Monitoring the project closely, whether you are the owner or the contractor, and taking preventive action instead of reactive action reduces the size and number of claims on a project.

2). The key to settling claims quickly is identifying the delays and their impacts at the earliest time possible.

3). Developing a good and realistic CPM which you can stick to using the crews you have based your estimate on will reduce the number of schedule deviations over which you, the contractor, have control over.

4). Going to court to settle a claim is costly. Settling early and directly with the other party is often the better choice.

5). Preparing your documentation to submit or defend a claim the second you realize that an event has occurred which has caused a schedule deviation will improve your chances for a fair settlement.

### 6.3 RECOMMENDATIONS

During the interview phase of the research for this paper many of the interviewees posed questions to the author that the author feels bear further research. The primary question was whether or not construction management (CM), looking at its true definition, really works? Most CM firms



that the contractor was delayed because the site wasn't available, then the owner should admit the fault, negotiate a settlement, and move on. The cost of preparing a claim is enormous and it just adds on to the cost of the extra work or delay, and the owner does not get one extra square foot of building for his money. It was added that sometimes stubbornness prevails and claims must then be prepared. But usually once the principles of the parties are presented the facts the one in the wrong usually sees that he is in a "no-win" situation and agrees in principle to settle. Then all that remains is to calculate the actual damages.

#### 5.4

#### PRAISE FOR MARTA

Several of the firms praised MARTA for its claims management during its construction of \$2 billion plus worth of projects. MARTA's philosophy was to settle a claim as soon as the costs could be identified and a settlement reached. The field engineers working in the claims office were given enough dollar authority to allow them to approve additional work on the spot if a fair and reasonable negotiated price and extension of contract time could be reached. This eliminated legal fees and costly delays which often arise out of waiting for authority to issue a change order or for money to be appropriated.







today deal strictly with analyzing claims and have little or no experience in managing projects. The interviewees were concerned that true CM firms would die out because of the CM industry's failure to live up to its expectations of being able to get a project done faster, cheaper, and with fewer claims..

The interviewees also wondered how the relationship between the owner, contractor, and A/E could be changed to reduce the number and size of claims. Some proposed that design-build or turn-key type projects could reduce the number of claims. The interviewees wondered if this would affect quality as well as costs.

Another area which the interviewees said deserved further research was the economic analysis of inefficient work and delays caused by schedule deviations. Some of the interviewees said that the calculation of the time impact is important but added that the real concern is the accurate identification of the additional costs.

And lastly the interviewees posed the question of which scheduling technique is the best overall to use on a project? They wondered which schedule type was best with respect to updating, communicating, and analyzing the project's status.

In closing, this paper has taken a look at some of the factors which affect the time aspect of construction delay claims. There are, however, many more factors which have an affect on the settlement of delay claims and the above recommendations are just some of those areas which deserve further research.



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## APPENDIX (A)





**THE ROBINS CORPORATION**

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**ST. MARTINS IN THE PINES**  
**BIRMINGHAM, ALABAMA**



***PROGRESS REPORT***

STATUS DATE

JULY 1, 1986

prepared by

**DRAPER AND ASSOCIATES**

ATLANTA FORT LAUDERDALE HOUSTON







ST. MARTINS IN THE PINES  
Birmingham, Alabama

PROGRESS REPORT

July 1, 1986

The weekly Job Coordination Meeting was held at 9:00 A.M. in the Robins Corporation Field Office. A site inspection preceded the meeting. Meeting attendees were as listed below:

6/24/86 07/01/86

Barry Morton	The Robins Corporation	<u>X</u>	<u>X</u>
Bill Robins	The Robins Corporation	<u>X</u>	
D.M. Nichols	The Robins Corporation	<u>X</u>	<u>X</u>
Phil Yance	The Robins Corporation	<u>X</u>	<u>X</u>
John Strickland	The Robins Corporation		<u>X</u>
Robert Wilson	The Robins Corporation		<u>X</u>
Bill Callans	The Robins Corporation		<u>X</u>
Ferry Price	The Robins Corporation		<u>X</u>
Mark Crawford	American Mechanical		<u>X</u>
Steve Knight	American Mechanical	<u>X</u>	<u>X</u>
Johnny Samples	American Mechanical	<u>X</u>	
Charles Higgins	D&G Electric	<u>X</u>	<u>X</u>
Bill Shehan	D&G Electric		<u>X</u>
Ray Davis	Fincher Fire Prot.	<u>X</u>	<u>X</u>
Michael Frey	Drywall Construction	<u>X</u>	
Gerald Batton	Drywall Construction	<u>X</u>	<u>X</u>
Andy Shugart	Shugart Painting	<u>X</u>	<u>X</u>
Troy Bartlett	G.E. Simpson Co.	<u>X</u>	
Jim Patterson	Bentley Carpets		<u>X</u>
Ruce Jones*	Draper & Associates	<u>X</u>	<u>X</u>

The next Job Coordination Meeting will be held at 1:30 p.m. on July 1, 1986 in the Robins Corporation Field Office. All active and near active subcontractors are required to attend this meeting.

Author of Report



PROGRESS REPORT

July 1, 1986

SUMMARY

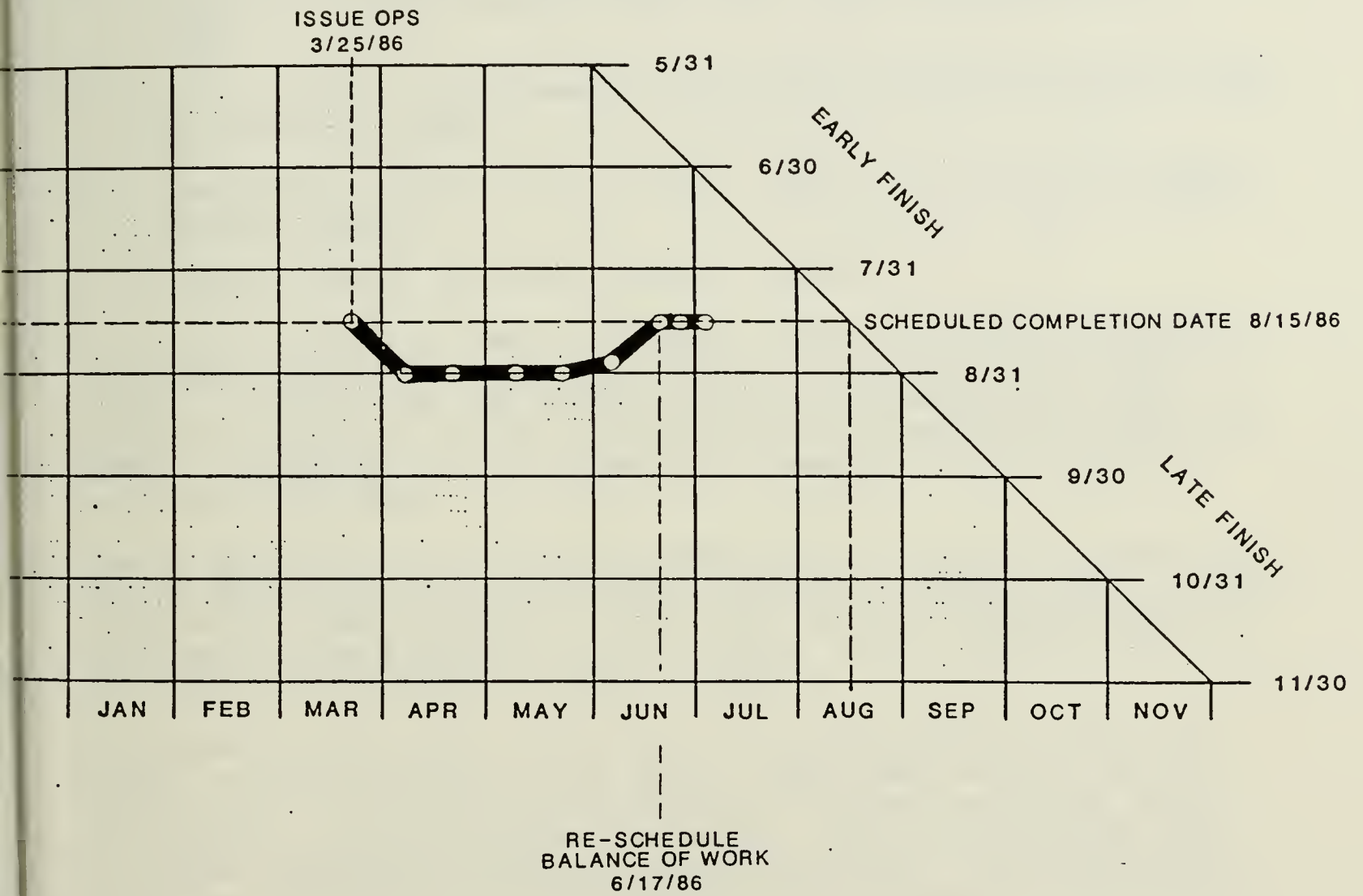
All sheetrock walls and ceilings will complete, including finish, on floors "1" through "4" by July 3, 1986. Painting of walls and ceilings is expected to be complete in all areas except kitchen by July 23, 1986, and in Kitchen by July 29, 1986. All interior finish operations should complete by August 1, 1986.

Work on the outside of the building, including roof trim and storefront installations, is currently expected to complete not later than July 11, 1986. Landscaping (by the Owner) is scheduled to begin July 10, 1986 and to complete July 30, 1986. Base, painting and lighting in the Parking Lots should be complete by August 1, 1986.

At the present time, substantial completion of the project is expected by August 1, 1986, which is consistent with the Revised Overall Project Schedule dated April 2, 1986. Enclosed for management review are the Updated Near Term Schedule dated June 24, 1986, the New Near Term Schedule dated July 1, 1986 and the Project Trend Chart.



TREND CHART





PROGRESS REPORT

July 1, 1986

PROBLEMS

Several design decisions are still outstanding, as listed below:

- a. Electrical hook-up requirement for four duct heaters (reference "Outstanding Item" #2C, report dated June 24, 1986).
- b. Final layouts for Basement and Elevator Machine Room (OI #2D, 2E, June 24, 1986).
- c. Landscaping design, First Floor, Area "C" drive-thru (OI#2F, June 24, 1986).
- d. Parking design (OI #2G, June 24, 1986).

Late delivery of casework for Third and Fourth Floors continues to impact carpet and plumbing fixture installations on these floors. Originally (per Overall Project Schedule dated April 2, 1986) all casework installations were to be complete by June 27, 1986. Currently, final shipment of casework is not expected until July 9, 1986.

Due to conflict in ceilings between duct and light fixtures in Dining Rooms (as noted in earlier reports), certain ducts in Room #140, First Floor, Area "A", will have to be relocated before ceilings can be completed in this area. It is expected that this duct will be relocated by July 2, 1986.

Late addition of track lighting in the Dining Rooms (#139 and #140), by the Architect, may impact completion of ceilings in these areas. Robins Corporation has still not received design drawings for this additional lighting. Once the drawings are received, potential delays can be identified. It is expected that the drawings will be received from the Architect by July 3, 1986.





PROGRESS REPORT

July 1, 1986

ACTION ITEMS

Robins Corporation to follow up with the Architect on outstanding items listed under Problem #1.

AMC to have water line installation complete by July 11, 1986.

Quarles Casework to have final delivery of vanities and cabinets for Third and Fourth Floors not later than July 9, 1986.

Robins Corporation to have air conditioning operating in Model Apartments and First Floor Office Area by July 9, 1986.



PROGRESS REPORT

July 1, 1986

STATUS

First Floor

Area "A"

Dining Rooms and Kitchen

Sheetrock walls and ceilings have been completed and prime painting of walls and ceilings is expected to complete by July 2, 1986. Certain duct had to be relocated in Dining Room #140 before the ceiling grid could be completed (reference Problem #3). Relocation of this duct and completion of the ceiling grid in Dining Room #140 is expected to be complete July 2, 1986. Painting of all ceilings is expected to complete July 2, 1986. Kitchen duct hood installations are expected to be complete by July 8, 1986. Quarry tile installations have been completed in the Kitchen, dishwashing and serving areas. Other installations in the Kitchen, including kitchen equipment by the Owner and ceiling grid are expected to be complete by July 17, 1986. All work in the Kitchen, including finish painting, caulking and installation of ceiling tile is expected to be complete July 30, 1986. In other areas of the First Floor, Area "A", all masonry work has been completed. Sheetrock walls have been completed and painting of walls is completed as well. Installation of toilet accessories and plumbing fixtures is expected to complete July 3, 1986. Ceramic tile installation should complete July 8, 1986. All doors and hardware in the entire First Floor, Area "A" should be complete by July 10, 1986. Carpet, base and ceiling tile installations are expected to take place the week of July 28, 1986.

Area "B"

Carpet, tile and base installations are underway and are expected to complete July 2, 1986. Model units should have water service by July 11, 1986. Ceiling tile installations are underway and should complete July 3, 1986 and door hardware installation is expected to begin July 3, 1986 and complete July 10, 1986. Carpeting in hallways in First Floor, Area "B" is expected to take place July 31, 1986 and August 1, 1986.



ST. MARTINS IN THE PINES  
Birmingham, Alabama

PROGRESS REPORT

July 1, 1986

Area "C"

Entrance storefront has been framed and Terrace storefront framed in and glazed. Plumbing fixture installations are underway and are expected to complete July 3, 1986. All brick masonry in the Core and sheetrock ceilings in the Core area on the First Floor are complete. Exterior Dryvit installation is underway and is expected to complete July 3, 1986. Sheetrock ceilings should be complete by July 7, 1986 and painted out by July 9, 1986. Door hardware installation is expected to complete July 10, 1986. The Core ceilings should be prime and finish painted by July 17, 1986. Work on the fireplace, including sheetrock and Dryvit should be complete by July 15, 1986. Installation of ceiling tile and carpeting in hallways should be complete by August 1, 1986.

Second Floor

Area "A"

Installation of hose kits for heat-pump units is complete. Vinyl wallcovering in the hallways is completed and hanging and finishing of all sheetrock walls and ceilings is complete. Ceiling grid has been completed as has prime painting of all walls. Finish painting is expected to complete July 16, 1986. Carpeting of apartments is underway and is expected to complete July 3, 1986. Texturing of Core ceilings will take place July 8, and 9, 1986 and all hallway vinyl wallcovering should commence July 10, 1986 and complete July 14, 1986. Door hardware installation is expected to take place starting July 11, 1986 and completing July 17, 1986. Vinyl wallcovering, ceiling tile and all hallway carpet and base should be complete by July 23, 1986.

Area "B"

Hallway vinyl wallcovering, ceiling grid and plumbing fixtures are complete. Finish painting of walls has begun and is expected to be complete July 16, 1986. Carpeting in apartments is expected to complete July 3, 1986. Fire alarm trim should be complete in all areas of the Second Floor by July 7, 1986. Vinyl tile installations should complete July 14, 1986. Vinyl wallcovering in hallways should complete July 14, 1986 and in all areas July 21, 1986. Carpet and base in hallways, and installation of ceiling tile should complete July 23, 1986.





ST. MARTINS IN THE PINES  
Birmingham, Alabama

PROGRESS REPORT

July 1, 1986

Area "C"

Ceiling grid, hallway vinyl wallcovering and plumbing fixtures are complete on Second Floor, Area "C". Carpeting of apartments is underway and should complete July 3, 1986. Bathroom tile and plumbing fixture installations should complete July 3, 1986. Vinyl tile installations should complete July 14, 1986. Finish painting is underway and should complete July 16, 1986. All vinyl wallcovering, floor hardware, hallway carpet, base, and ceiling tile installation should complete July 23, 1986.

Third Floor

Area "A"

Apartment panel make-up has been completed and hose kits installed for heat-pump units. Carpeting of apartments in all areas of the Third Floor is expected to begin July 15, 1986 and to complete July 7, 1986. Ceramic tile installations are expected to start July 3, 1986 and complete July 7, 1986. Finish painting should commence July 3, 1986 and complete July 23, 1986. All finish operations should complete, including hallway carpet and base, by July 25, 1986.

Area "B"

Ceiling grid installations have begun and are expected to complete July 3, 1986. Prime painting of walls should complete July 3, 1986 with finish painting expected to begin July 7, 1986 and to complete July 23, 1986. Vinyl tile installation is expected to take place July 9, and 10, 1986. Carpeting in apartments should commence July 5, 1986 and complete July 17, 1986. All vinyl wallcovering, ceiling tile, carpeting and base in hallways should complete by July 25, 1986.

Area "C"

Textured ceilings are complete in apartments. Ceiling grid installation is expected to be complete by July 3, 1986. Prime and finish painting operations should commence July 7, 1986 and complete July 23, 1986. Toilet accessories should be installed starting July 3, 1986 and completing July 10, 1986. All casework on the Third Floor should be complete by July 17, 1986 to allow plumbing fixtures to complete one day behind on July 18, 1986.



## PROGRESS REPORT

July 1, 1986

Carpeting in apartments should be complete by July 17, 1986 and carpeting in hallways, including rubber base, should be complete by July 25, 1986. All finish operations in all areas of Third Floor should complete July 25, 1986.

Fourth FloorArea "A"

Prime painting of walls is complete. Make-up of apartment panels has been completed and hose kits installed for heat-pump units on the Fourth Floor. Ceramic tile installations are underway and are expected to complete July 2, 1986 in all areas of the Fourth Floor. Finish painting operations have begun and are expected to complete July 16, 1986. Carpeting in apartments should take place July 11, 1986 to July 14, 1986. Vinyl wallcovering in hallways should be completed by July 9, 1986 to allow fire alarm trim to be complete by July 11, 1986. Carpeting in base and hallways should commence July 18, 1986 and complete July 21, 1986. Installation of door hardware is expected to begin July 25, 1986 and to complete July 31, 1986.

Area "B"

Ceramic tile installation is underway and should complete July 2, 1986. Toilet accessories should be complete by July 3, 1986. Finish painting has begun and should complete July 16, 1986. Ceiling tile, vinyl wallcovering, carpet and base in hallways should be complete by July 21, 1986. Door hardware installation should be complete by July 31, 1986.

Area "C"

Removal of temporary wiring should be complete by July 7, 1986. Wood trim is complete. Prime painting of walls has been completed and finish painting should be complete by July 16, 1986. Casework installations in all areas of the Fourth Floor should be complete by July 10, 1986 to allow plumbing fixtures to be complete in all areas by July 11, 1986. Vinyl wallcovering, HVAC trim, ceiling tile hallway carpeting and base should be complete on the Fourth Floor by July 21, 1986. Door hardware installations are expected to complete July 31, 1986.



PROGRESS REPORT

July 1, 1986

Basement

Sprinkler rough-in is completed. Storefront has been framed and glazing is expected to be complete July 11, 1986.

Attic and Roof

Roof trim installation is proceeding and is expected to complete July 7, 1986 with prime and finish painting of roof trim to complete by July 11, 1986. Cleaning of attic has begun and is expected to complete July 7, 1986. Insulation of attics should begin July 9, 1986 and should complete by July 18, 1986.

Exterior

All brick masonry has been complete and scaffold is expected to be removed by July 2, 1986. Landscaping by the Owner is expected to begin and to complete July 30, 1986. Water main installation is expected to be complete by July 11, 1986 to allow Model Unites to have running water by that date. Assuming that scaffolding is removed by July 2, 1986 as expected, gas line installation should complete by July 3, 1986. Underground electric for Parking Lot lighting should complete July 3, 1986 also. Installation of concrete curbs for the Parking Lot should take place the week of July 7, 1986. Restoration of base is currently expected to take place the week of July 21, 1986 and all asphalt paving and Parking Lot lighting should be complete by August 1, 1986.





1ST FLOOR

AREA A

KITCHEN & DINING RMS

KITCHEN QUARRY TILE

OTHER

ELEC. TRIM & FIRE ALARM

AREA B

AREA C

FRAME ENTRANCE STOREFRONT

FRAME & GLAZE TERRACE STOREFRONT

RELOCATE WATER PIPE

COMPL. CLG GRID

COMPL. S/R WALLS & CLGS

KITCHEN DUCT HOODS

SURFACE MOUNT DINING RM LIGHT FIXT

MASONRY SOUTH

CARPET, VCT & BASE

COMPL. S/R WALLS

PAINT

TOILET ACCESS

COMPL. WATER SVC TO MODEL UNITS

CARPET, VCT & BASE

CLG TILE

DOOR HDWR

OWNER MOVE-IN 1ST FLR OFFICES

LIGHT CANS

CARPET, VCT & BASE

RECV ENTRANCE LIGHT FIXT

COMPL. S/R CLGS

PRIME CLGS

FINISH PAINT

CLGS

DOOR HDWR

VWC

CLG TILE

FIREPLACE S/R

COMPL. EXT DRYVIT

PLUG FIXT

FIREPLACE GAS PIPING

PRIME PAINT CORE CLGS

FINISH PAINT CORE CLGS

WATER PROOF AT TERRACE

● GLAZE ENTRANCE STOREFRONT

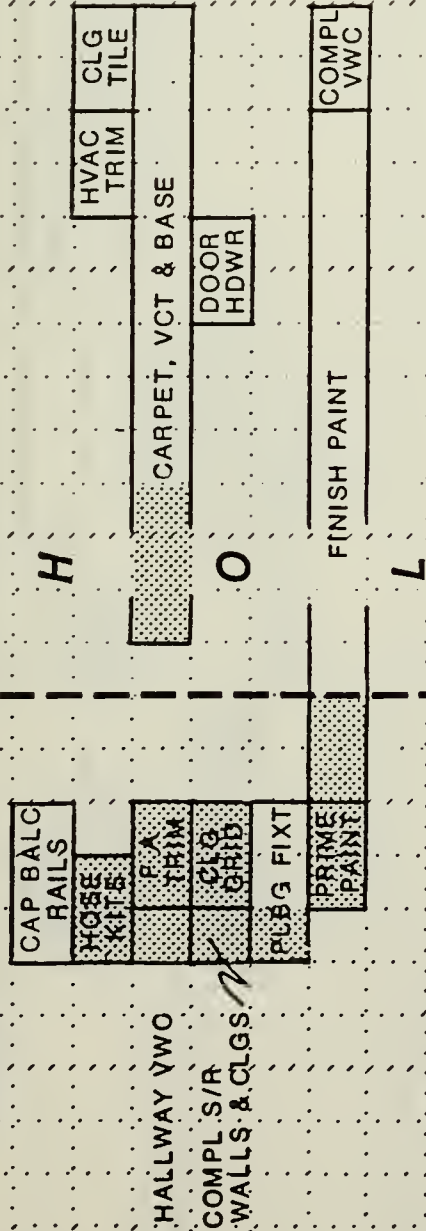
▽ FIREPLACE DRYVIT





# 2ND FLOOR

## AREA A



## AREA B



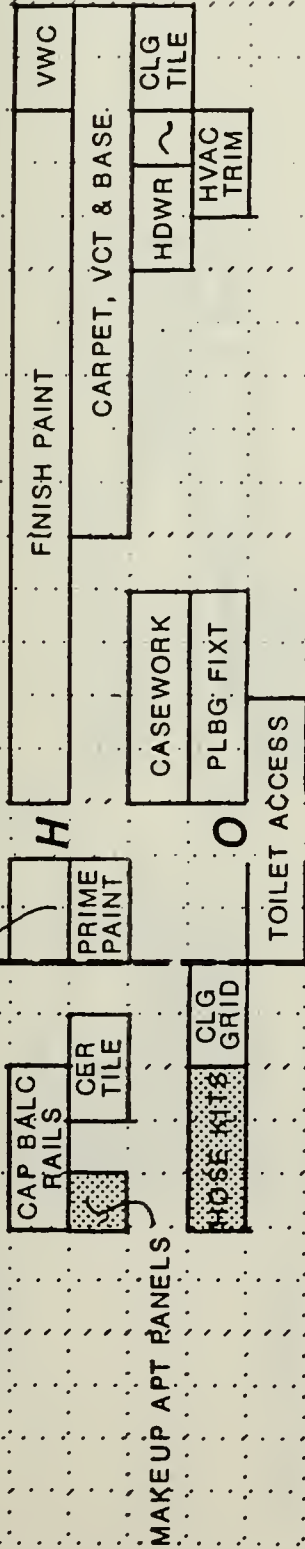
## AREA C



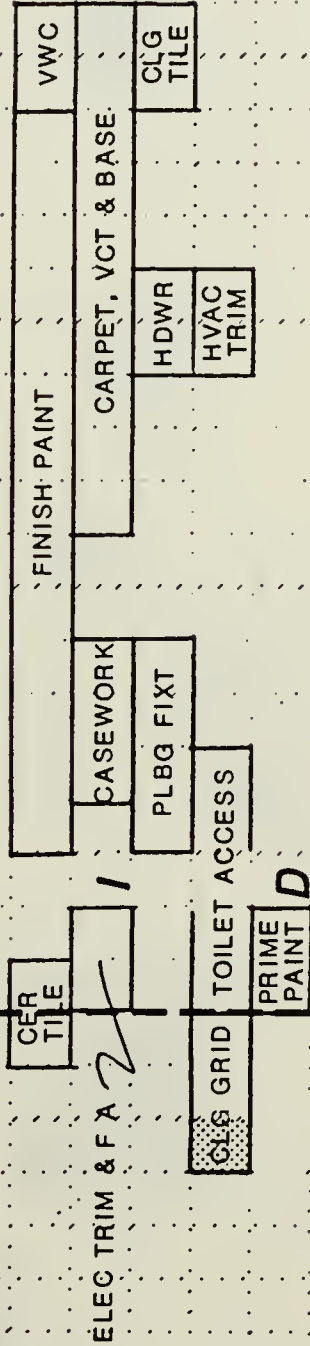


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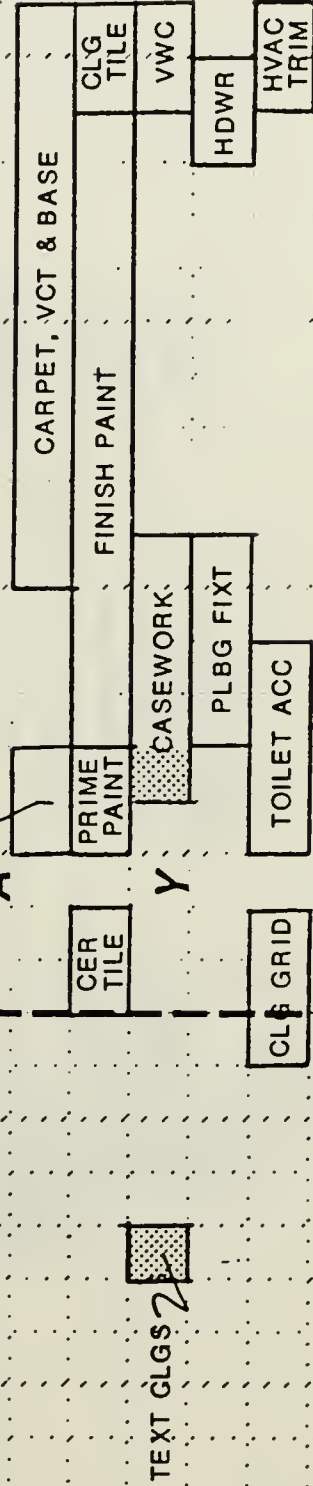
## AREA A



## AREA B



## AREA C

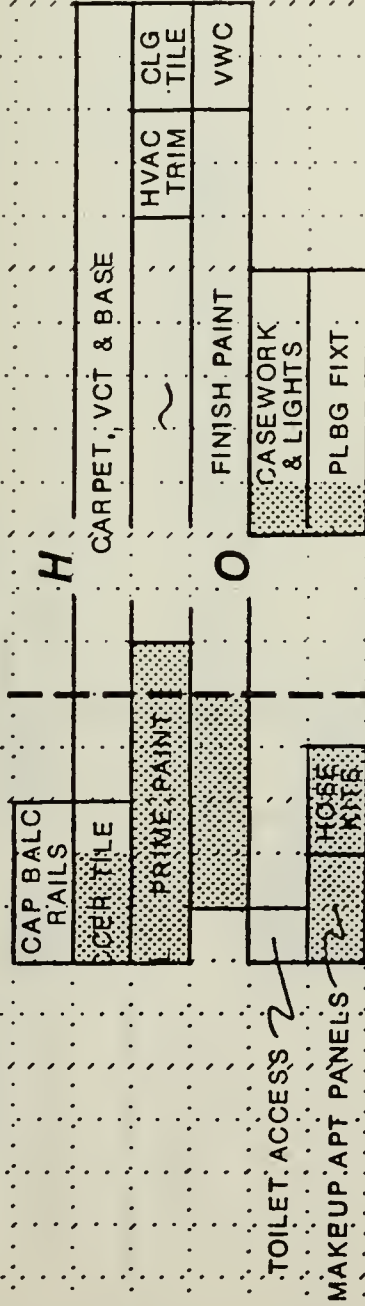




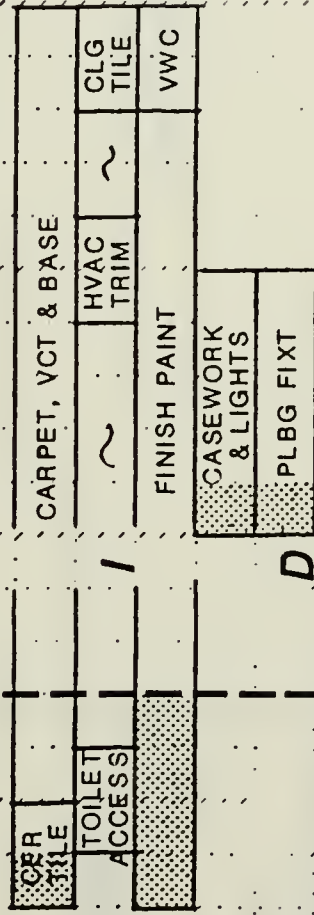


# 4TH FLOOR

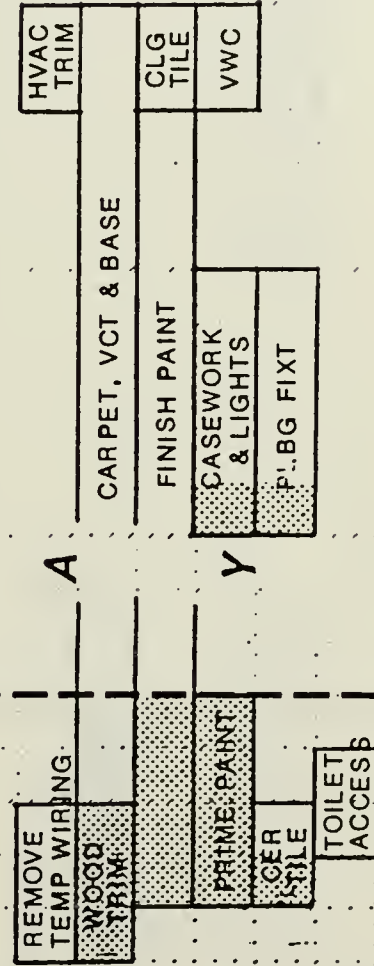
## AREA A



## AREA B



## AREA C







BASEMENT

SPRINKLER R/I



FRAME GLAZE H

STOREFRONT

ATTIC/ROOF

CLEAN ATTIC O

ATTIC INSULATION

COMPL ROOF TRIM

PRIME PAINT ROOF TRIM

FINISH PAINT ROOF TRIM L

EXTERIOR

COMPL BRICK

REMOVE SCAFFOLD I

LANDSCAPING BY OWNER

WATER MAIN

PROCURE MATERIALS

EXCAVATE/LAY/BACKFILL D

GAS SVC LINE

EXCAVATE/LAY BACKFILL A

PARKING LOT



COMPL U/G ELEC

CONC CURBS Y

RESTORE BASE ASPHALT PAVING

LIGHT POLES



## 1st FLOOR

PRIME PAINT  
PAINT GLGS

## KITCHEN & DINING

CER TILE	KITCHEN CLG GRID
-------------	---------------------

RELOCATE DUCT.

2-RELOCATE WATER PIPE

DINING RM. CLG GRID-

LIGHT FIXTURES

D. UCT HÒODS

OWNER SET KITCHEN EQUIPMENT	KT
-----------------------------	----

HOOK -UP	
KITCHEN EQUIP	
CAULK	
& ADJUST	

CLG TILE	FINISH PAINT
-------------	-----------------

COMPL KITCHEN CLG GRID

HÀNG · DOQR · 2

VW.C	2	FA TRIM
------	---	---------

PLBQ F1XT

## OTHER

CER  
TILE

TOILET ACCESS:

DOOR HDWR

BATH TILE: S

CLG TILE	CARPET & BASE
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ᐃ

CARPET & BASE 2

DOOR HDWR

COMPL WATER SERVICE  
TO MODEL UNITS

CLG  
TILE

CARPET  
HALL

○

CARPET; TILE & BASE

DOOR HDWR

PRIME CLGS  
FINISH PAINT CLGS

COMPL  
S7R CLGS

vwc

PRIMER  
CORE CLG

**FINISH PAINT  
CORE CLGS**

GLAZE STOREFRON

WATERPROOF  
TERRACE

COMPL EXT DRYVIT 2

RECEIVE	S/R & DRYVIT
FIREPLACE COLS	FIREPLACE COLS

**FIREPLACE  
GAS PIPING**

CLG TILE	CARPET HALL
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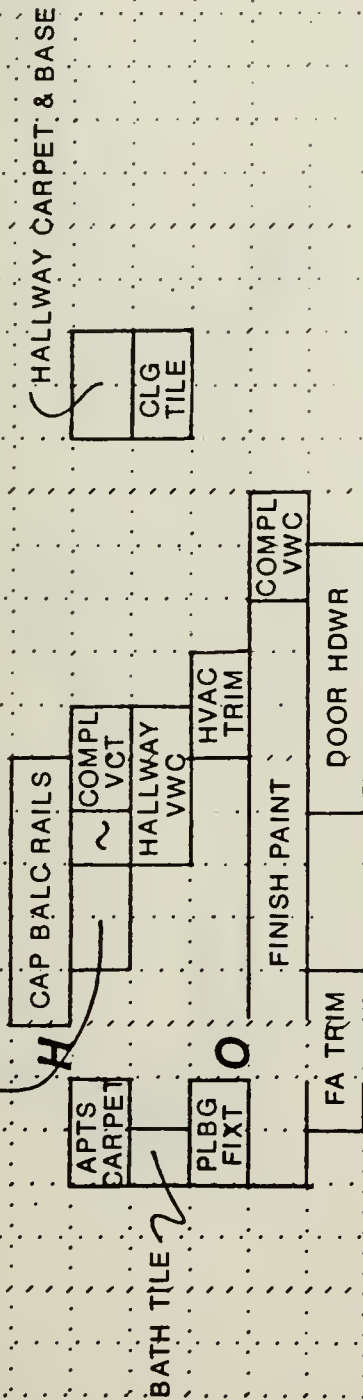




2nd FLOOR

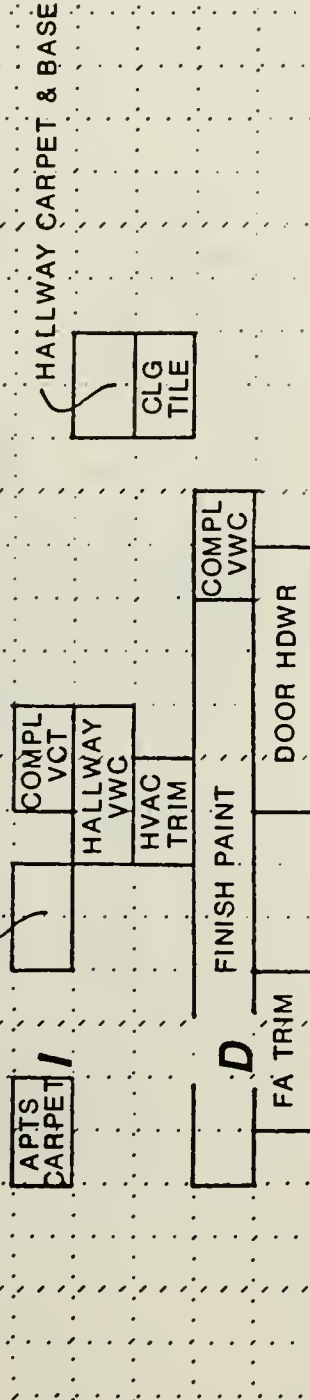
A

TEXTURE CORE CLGS



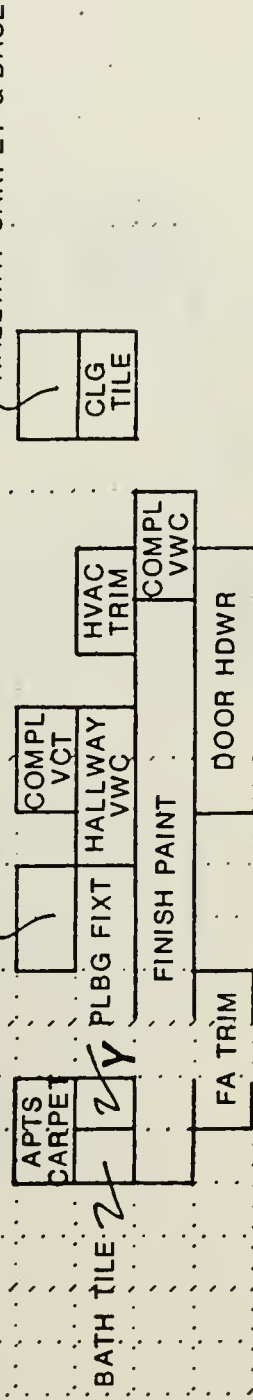
B

TEXTURE CORE CLGS



C

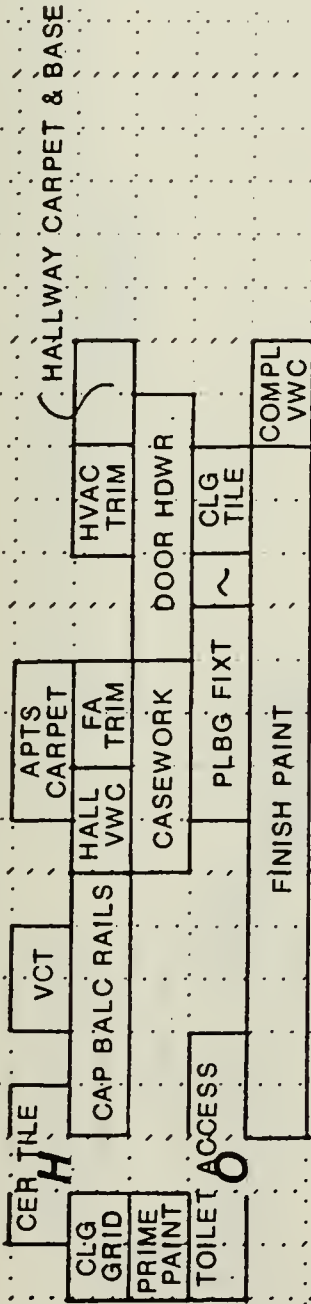
TEXTURE CORE CLGS



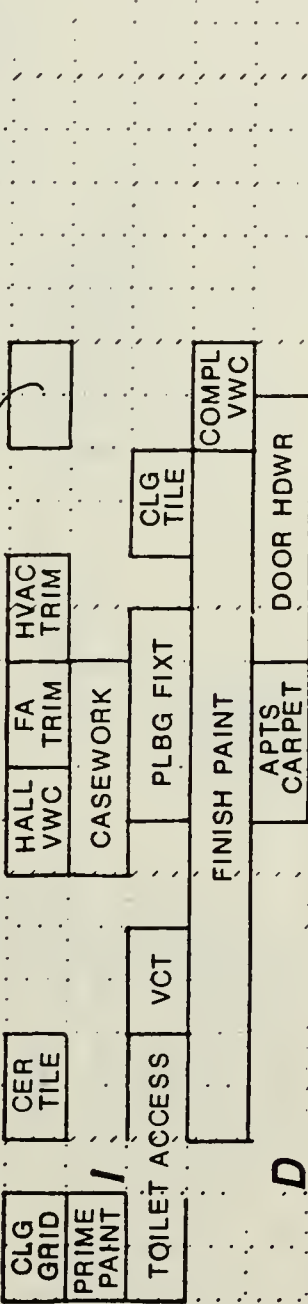


# 3rd FLOOR

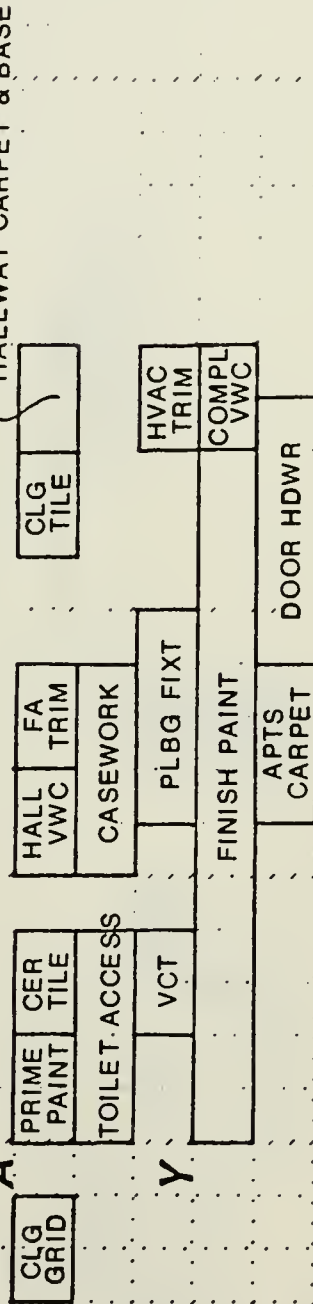
"A"



"B"



"C"







# 4th FLOOR

"A"

TOILET ACCESS		CAP BALC RAILS		HALLWAY CARPET & BASE		DOOR HDWR	
CER TILE	CLG GRID	CASEWORK	PLBG FIXT				
		HALL VWC	ARTS CARPE				
LIGHT FIXT		VCT	FA TRIM	HVAC TRIM	COMPL VWC		
		FINISH PAINT			CLG TILE		

"B"

TOILET ACCESS		CASEWORK		HALLWAY CARPET & BASE		DOOR HDWR	
CER TILE	CLG GRID	PLBG FIXT	APTS CARPET				
		HALL VWC	HVAC TRIM				
LIGHT FIXT		VCT	FA TRIM	COMPL VWC			
		FINISH PAINT			CLG TILE		

"C"

TOILET ACCESS		CASEWORK		HALLWAY CARPET & BASE		DOOR HDWR	
CER TILE	CLG GRID	REMOVE TEMP WIRING	PLBG FIXT				
		HALL VWC	APTS CARPE				
LIGHT FIXT		VCT	FA TRIM	COMPL VWC	HVAC TRIM		
		FINISH PAINT			CLG TILE		







## APPENDIX (E)

### THE DIFFERENT TYPES OF FLOAT IN CPM (I-J METHOD)

In addition to total float there are three other types of float for each activity. They are free float, interfering float, and independent float.

Free float may be defined as the time span in which the completion of an activity may occur and not delay the finish of a project nor delay the start of any following activity (4). This can be expressed in equation form as:

$$FF(I) = ESD(JK) - EFD(IJ)$$

Free float may be thought of as the amount of leeway of an activity if all activities of the project are to be started at their earliest possible time. As such, it can never be greater than the total float but may be equal to the total float when the activity is on the critical path (4).

Interfering float may be defined as the time span in which the completion of the of an activity may occur and not delay the completion of the project but within which completion will delay the start of some other following activity (4). This can be expressed in equation form as:

$$INTF(IJ) = TF(IJ) - FF(IJ)$$

From the definition of interfering float it can be seen that the boundaries of interfering float are the latest that activity (IJ) must be completed and the earliest that the





following activity can start (4). This can also be expressed in equation form as:

$$INTF(IJ)=LFD(IJ)-ESD(JK)$$

Independent float may be defined as the time span in which the completion of an activity may occur and not delay the completion of the project, not delay the start of any following activity, and not be delayed by any preceding activity (4). This can be expressed in equation form as:

$$INDF(IJ)=ESD(JK)-LFD(HI)-T(IJ)$$

Examining the above equation it can be seen that often the value of the independent float will be negative. The reason being that the difference between the ESD of the following activity and the LFD of the preceding activity may not allow enough time to complete activity (IJ). In this case the value of the independent float is listed as zero.



## APPENDIX (C)

### THE DIFFERENT TYPES OF FLOAT IN CPM (PRECEDENCE METHOD)

In the precedence method of CPM there are three other types of float in addition to total float. They are free float, interfering float, and independent float. The definitions of each of these floats is the same as in the I-J method of CPM. However, the expressions for calculating each float are different. The definitions and expressions are presented below.

Free float may be defined as the time span in which the completion of an activity may occur and not delay the finish of a project nor delay the start of any following activity (4). This can be expressed in equation form as:

$$FF(I) = \text{Min}(\text{all } J) [ESD(J) - EFD(I)]$$

Which can be rewritten as:

$$FF(I) = \text{Min}(\text{all } J) [LAG(IJ)]$$

Interfering float may be defined as the time span in which the completion of an activity may occur and not delay the completion of the project but within which completion will delay the start of some other following activity (4). This can be expressed in equation form as:

$$INTF(I) = TF(I) - FF(I)$$

Independent float may be defined as the time span in which the completion of an activity may occur and not delay



the completion of the project, not delay the start of any following activity, and not be delayed by any preceding activity (4). This can be expressed in equation form as:

$$INDF(J) = \text{Min}(\text{all } K)[ESD(K)] - \text{Max}(\text{all } I)[LFD(I)]$$

Which can be rewritten as:

$$INDF(J) = EF(J) - \text{Max}(\text{all } I)[TF(I) - LAG(IJ)]$$



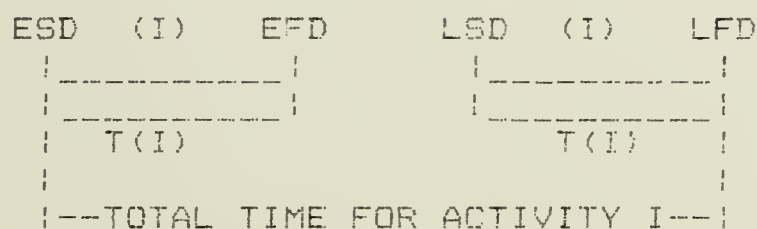
## APPENDIX (D)

## DEVELOPMENT OF THE TOTAL FLOAT EQUATION FOR THE PRECEDENCE METHOD

The total float of an activity can be defined as the time span in which the completion of an activity may occur and not delay the completion of the project (4). Examining the diagram below it can be seen that the total float for activity (I) can be written in equation form as:

$$TF(I) = LFD(I) - EFD(I) \quad (a)$$

or as  $TF(I) = LSD(I) - ESD(I)$  (b)



Remembering that the LFD of activity(I) is equivalent to the Min(all J)[LSD(J)], this equation can be rewritten as:

$$TF(I) = \min(\text{all } J) [LSD(J) - EFD(I)] \quad (c)$$

Noting that the  $TF(J)=LSD(J)-ESD(J)$ , and using this to solve for  $LSD(J)$ , gives:

$$\text{LSD}(J) = \text{TF}(J) + \text{ESD}(J) \quad (d)$$

We can substitute this into equation (c) above, which yields:

$$TF(I) = \min_{(all \ J)} [ESD(I) + TF(J) - EFD(I)] \quad (e)$$

Rearranging the expression gives:  $TF(I) = \text{Min}(\text{all } J) [ESD(J) -$

$$EFD(I)+TF(J)] \quad (f)$$

Substituting the definition of lag between activities I-J,





ie,  $Lag(I-J)=ESD(J)-EFD(I)$ , into this equation gives:

$$TF(I)=Min(all J)[LAG(I-J)+TF(I)] \quad (g)$$

Which is the expression used in the text of this paper.



## APPENDIX (E)

### GUIDELINES FOR CHOOSING COMPUTER HARDWARE

Deciding whether a firm needs a computer or not is not an easy question to answer. Most decisions which concern such a large capital investment such as procuring a computer are based on a benefit to cost study.

The costs of implementing a computer system are easy to establish. There is the one time cost of procuring the computer hardware and the necessary software programs to operate the computer. Then there are the recurring costs of operating the equipment. These include procuring new and more sophisticated software programs, maintaining the hardware (usually done under a service contract), and the salary of the computer operator.

Quantifying the benefits is not quite as easy. The benefits of improved management practices are hard to equate to dollars. Additionally, some of the benefits can not be equated to dollars. For example, there might be an psychological benefit a computer would provide when marketing the firm. The popularity of computers leads one to believe a firm is up to date by the mere presence of a computer in the firm's office. And there are of course the costs savings of doing much of the repetitive home office work automatically (A).



But if one was going to attempt to quantify both the dollars savings and the effect of improved management which result from purchasing a computer the following guidelines, although not all inclusive, may be helpful:

#### DOLLAR SAVINGS

The first step is to develop a worksheet similar to the one recommended by Andian (1), shown on the next page, tailoring it to fit your operations. Enter the values for each category and sum at the bottom. Convert the manhours to dollars, then add the annual equivalent cost of the purchase of the hardware and the annual operating costs. The comparison of the bottom line will provide the firm with a fair estimate of whether the computer will save the firm money in the day to day operations of your firm. Note that it may be necessary to hire a professional for assistance in estimating the employee hours per month for the computer.





# COMPUTER FEASIBILITY

	MANUAL EMPLOYEE HOURS PER MONTH	COMPUTER EMPLOYEE HOURS PER MONTH
PAYROLL		
WEEKLY CYCLE		
UNION REPORTS		
QUARTERLY REPORTS		
ANNUAL REPORTS		
CHECK RECONCILIATION	-----	-----
ACCOUNTS PAYABLE		
PURCHASE JOURNAL		
CASH DISBURSEMENTS		
VENDOR ANALYSIS	-----	-----
JOB COSTING		
MONTHLY REPORTS		
JOB REPORTS		
MISCELLANEOUS	-----	-----
INVENTORY		
JOB REPORTS		
PERPETUAL RECORDS	-----	-----
SALES AND A/R		
REVENUE REPORTS		
AGING REPORTS		
CASH RECEIPTS	-----	-----
JOB MANAGEMENT		
SCHEDULING		
ESTIMATING REPORTS		
CASH FLOW	-----	-----
GENERAL LEDGER		
GENERAL JOURNAL		
TRIAL BALANCE		
MONTHLY STATEMENTS	-----	-----
TOTAL EMPLOYEE HRS/MTH	-----	-----
TOTAL EMPLOYEE HRS/YR	-----	-----
TIMES AVERAGE HOURLY RATE		
(A) ANNUAL EMPLOYEE COST	-----	-----
(B) EQUIVALENT ANNUAL		
PURCHASE COST		
FOR COMPUTER		-----
(C) SERVICE CONTRACT		
FOR COMPUTER		-----
(D) OVERHEAD COSTS	-----	-----
TOTAL (A+B+C+D)	-----	-----



## MANAGEMENT IMPROVEMENT

Measuring improved management is addressed in a more nebulous non-quantitative manner. A series of questions, as recommended by Andian (1), are asked for which the response is either yes or no. If there are more yeses than nos, then the purchase of a computer should be seriously considered. The list of questions, as with the dollar savings, will need to be tailored to your operation.

1. The accuracy of your estimates are such that the actual costs of a project vary more than 7 percent from your estimated cost.

2. You do not have an "on-paper" data file of past performance regarding productivity or costs for individual work item.

3. You do not have an equipment estimating system that enables you to keep track of the cost of owning a piece of equipment.

4. Your firm's manual record-keeping system is such that the collected information is accurate and would support a computerized system.

5. You do not keep records of material wastage on a project to enable you to better estimate a future project.

6. The initial estimate for a project is not revised as the project progresses.

7. You do not keep track of the cost or productivity trend as a function of jobs and time.

8. The overhead allocated to individual projects is not



determined through analysis of past records

9. Job overhead costs are applied to projects rather than determined by analysis of past projects.

10. The estimating task takes more than 100 man-hours per \$1,000,000 of work estimated (1).

All of these questions can be summed up into one question, "does the firm need to improve the management, flow and handling of data and information within the firm?"

More than likely most construction firms will answer in the affirmative. That leads us to the next question, what hardware to select?

The computer industry is moving so fast and the needs of each company are so diverse that no attempt will be made to recommend any one computer type or model. Rather, five guidelines are provided from which the reader can start their search for a computer system (1). These guidelines are:

1. Availability and dependability of service.
2. Availability of off the shelf software.
3. Projected life of the hardware.
4. Capacity.
5. Costs.

One drawback of automating a firm is when the computer goes down so does the firm. The importance of quick and dependable service to get the computer back on line is easily understood. Computers cost money to operate, but they can cost more in lost business and efficiency when they do not.

Having a proprietary software program developed for the firm is expensive. Updating or expanding its capability adds



additional costs. The software industry produces programs for almost every need and they are available at a reasonable cost. The selection of hardware which is compatible with off the shelf programs allows the firm to expand its own capabilities without big expenditures.

Computer hardware is continually evolving and a computer which was state of the art last year might be outdated two to three years from now. This can result in a computer not being able to run the new software packages which come available. This may be tough to anticipate and there's no guarantee that any one brand or model will be compatible with future developments in the software industry. But by buying a well known leader in the industry chances are the useful life of the hardware will not be a problem. See the next page for an article from the Atlanta Journal-Constitution, 10 August 1986, which provides a different view on this subject.

Before buying any hardware the demands that will be placed upon it must be identified. The required capacity of the memory, the speed at which the computer operates, the programs that the firm will use, the need to print output, and the possibility of networking are all factors to consider when buying the hardware. No need to buy a 20 ton dump truck when all that was needed was a 1/2 ton shortbed pickup. The full potential of the system will never be used and the savings will be eaten up by operating costs. Even a more disturbing thought would be the opposite.

Finally cost. Computers are expensive. But by researching the four previous guidelines extensively, a firm





can procure a system which will meet their needs and which will save them money instead of costing them money.



**COMPUTERS**

# Clones grab big share of IBM PC's market

**By Peter H. Lewis**

The New York Times

Dozens of companies are making copies of the IBM PC, XT and AT computers and selling them for hundreds of dollars less than the originals. And thousands of people are buying, or thinking about buying, these "clone" machines, a trend that has stirred the International Business Machines Corp. into action.

IBM recently cut the prices its dealers pay for the computers. The dealers are expected to pass along part of the savings to the consumer, thus narrowing the price gap between the PC and its imitators, but in the end there will always be cheaper alternatives.

Some dealers say they expect a clone with 256K memory, one disk drive and a keyboard to crack the \$500 price barrier soon. When that happens, IBM will be more likely to abandon the PC than fight for the crumbs. The company's chairman, John F. Akers, said as much earlier this summer, telling financial analysts that when the PC begins selling as a commodity, he could see IBM "departing from that part of the market."

If so, the IBM PC as we know it is doomed, because computers are already viewed as a commodity by many buyers. They simply want a box that can run popular software, and if they can save money by buying it at a discounter, all the better. The clones are, for the most part, very close to the PC in terms of capability; some of the AT clones, moreover, are faster as well as cheaper. If the clone will do the same things as the original, why pay hundreds more for the label?

Peace of mind, apparently. Given two apparently identical boxes, one costing \$795 and one \$1,595, many prospective buyers still seem uneasy in choosing Brand X. Inexpensive, however, does not necessarily mean cheap. The savings are largely a result of cheap labor and reverse engineering (assiduously copying and modifying the technology IBM went to great expense to develop).

Some early copycats have gained respectability; Compaq and Tandy, for example, have transcended the "clone" image, and later ar-

rivals, including Leading Edge (made by Daewoo and Mitsubishi) and Epson Equity, are making strong gains. The newest low-cost rivals, from companies such as PC's Limited, PC Network and PC USA, are likely to hurt Leading Edge and Epson more than IBM.

Despite the potential for cut-throat competition at minimal profit, some companies that used to work with IBM are joining the feeding frenzy. Computerland, a retail chain that sells PCs, is now going into competition with its lower-cost BC88 and BC826 compatible computers. Tandon, a disk-drive maker, is also introducing a computer under its own name. It is not inconceivable that some day even Sears may introduce a Kenmore line of computers.

The biggest potential problem is compatibility: Will the box run all software written for the PC? Will it run new generations of software to come? The clones are somewhat imprecisely named because they closely mimic, but do not identically copy, the operations of the original. If 99 out of 100 programs run without a hitch, this is little comfort to the person trying to run the 100th. And will the clone be able to use other peripherals, such as multi-function boards and modems? Take your most frequently used software into the store and put it through the paces, and ask if your plug-in boards have already been tested for compatibility.

How reliable are the machines? Most of the low-cost clones have been on the market for just a few months, and repair and service information is hard to find. Still, one corporate buyer who switched to clones from IBM reports that breakdowns are no more frequent. (At local service prices, which are often over \$100 an hour, the \$500 clone is very close to being a disposable item.)

If the box runs the software, appears to have a good record of reliability and comes with a good warranty, there is little reason to pay extra for the fancy nameplate.

The numbers are not in for this year, but several industry surveyors say IBM's share of the personal computer market has been eroding significantly.



## APPENDIX (F)

### PROJECT MANAGEMENT SOFTWARE PROGRAMS

There are numerous software packages available for project scheduling. The 1986 International Computer Programs (ICP) Directory, 55th edition, lists 75 project management programs for microcomputers, of which 46 deal specifically with scheduling. The 1986 International Business Machine (IBM) PC-Software Directory lists 29 project management programs for microcomputers, of which 17 deal specifically with scheduling. These directories provide a brief summary of the main features of each program, a source, and a cost if possible. That portion of each directory which deals with scheduling has been reproduced on the following pages for your convenience.

The directories do not rate the programs. The author, however, researched the first six issues for 1986 of the periodical "Software News" and the number one best-selling project scheduling package was the "Project Manager Workbench". Technical reviews of the programs are available from the "Ratings Newsletter (Software Digest)". However, due to copyright restrictions no information from the Newsletter can be reproduced in this appendix. The reader is directed to the September, 1985, issue of Software Digest for further reading. A more current review should be available in the September, 1986, issue when it is released.





**Contact Data**  
Sherrell Harper  
Director, Sales and Marketing  
Computer Cognition  
225 W. 30th Street  
National City, CA 92050  
Tele. 619-474-6745  
Telex 695212 RMIMARINE NTCY  
**Pricing**  
\$3,000.00—  
\$9,000.00/Binary  
\$4,000.00—  
\$12,000.00/Source  
**P12347**

# **ACUITY PROJECT SCHEDULING**

**Product Type:** Applications Software  
**Geographic Area Served:** United States, Canada, Central/South America, Australia/New Zealand  
**Hardware Supported:** DEC VAX; Harris; Gould; AT&T 3B Series; Sperry Mini; Convergent Technologies; Sun Microsystems; Motorola; Altos; Fortune; UNIX-based Hardware  
**Operating Systems:** VMS, ULTRIX, VOS, UNIX, XENIX  
**Languages:** COBOL

**Number of Clients/Users:** New Product  
**Narrative:** The ACUITY Project Scheduling system contains all the tools necessary to forecast, manage and cost projects. It is a fully on-line system which combines planning, control and communication features to assist management of large-scale projects in a variety of engineering, construction or manufacturing applications. It provides multi-project capabilities with up to 3,000 activities per project. Each activity may define up to 55 predecessors. Critical path analysis with network diagrams supporting both precedence and I-J notation methods of analysis is provided. Interactive features provide the ability to generate any number of what-if scenarios. A 90-day warranty for micros is included. Manual is included; priced separately at \$60.00.

**Contact Data**  
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225 W. 30th Street  
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Tele. 619-474-6745  
Telex 695212 RMIMARINE NTCY  
**Pricing**  
PRICE UPON  
REQUEST  
**P27757**

# **ACUITY WORK BREAKDOWN STRUCTURE REPORTING**

**Product Type:** Applications Software  
**Geographic Area Served:** United States, Canada, Central/South America, Australia/New Zealand  
**Hardware Supported:** DEC VAX; Harris; Gould; AT&T 3B Series; Sperry Mini; Convergent Technologies; Sun Microsystems; Motorola; Altos; Fortune; UNIX-based Hardware  
**Operating Systems:** VMS, ULTRIX, VOS, UNIX, XENIX  
**Languages:** COBOL

**Number of Clients/Users:** New Product  
**Narrative:** ACUITY Work Breakdown Structure Reporting is used in conjunction with the ACUITY Project Management system. The system provides detail for a user-defined specification of task groupings and a set of reports which reflect those groupings. Up to nine levels of user-specified groupings, called WBS units are allowed with user-specified names for these entities. For each level and each WBS unit, labor hour, cost and ODC budgets can be specified. Reports show comparison of actual with budgeted amounts for hours and costs or revenues. WBS reports can be run for any date range (weekly, monthly, project-to-date and year-to-date). A 90-day warranty for micros is included. Manual is included; priced separately at \$60.00.

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**Pricing**  
PRICE UPON  
REQUEST  
**P27758**

# **IDC PROJECT MGR.**

**Product Type:** Turnkey System  
**Geographic Area Served:** United States  
**Hardware Supported:** Data General Mini; IBM PC-AT  
**Operating Systems:** RDOS, SuperDOS

**Languages:** BASIC  
**Number of Clients/Users:** 8  
**Narrative:** Project MGR. is a complete system for management of time, integrating job cost entry and reports, billing and sales analysis with personnel labor distribution and time analysis. Project management modules are linked with general ledger, accounts receivable and accounts payable. All parts of the system may be customized to match existing business procedures.

**Contact Data**  
Joseph F. deSpautz  
President  
Applied Digital Communications  
214 Flynn Avenue  
Moorsetown, NJ 08057  
Tele. 609-234-3666  
**Pricing**  
\$15,000.00  
and Up  
**PURCHASE**  
**P28214**

# **APECS/8000**

**Product Type:** Applications Software, Turnkey System  
**Geographic Area Served:** United States, Canada, United Kingdom, Europe  
**Hardware Supported:** DEC VAX, MicroVAX; AT&T 3B Series  
**Operating Systems:** VMS, UNIX, ULTRIX  
**Languages:** C Language, FORTRAN  
**Number of Clients/Users:** 12

**Narrative:** APECS/8000 is an integrated project management system designed for multi-project environments ranging from 50 to 32,000 activities. The system is designed for the non-data processing professional, and can be operated in menu or command mode. The distinguishing features of APECS/8000 are the customizable menus and security levels, management graphics, relational DBMS user commands, project summarization and reporting. The main analysis capabilities include CPM/PERT, resource under/over-utilization, cost over/underrun/variance, what-if, earned value, custom applications and DoD cost schedule control system criteria reporting. The APECS/8000 system can be operated in an on-line real-time environment or in deferred mode. One year of maintenance is included; 10 percent of purchase price per year thereafter.

**Contact Data**  
Glenn O. Gumley  
Manager, PMS Marketing  
ADP Network Services, Inc.  
175 Jackson Plaza  
Ann Arbor, MI 48106  
Tele. 313-769-6800  
**Pricing**  
\$27,000.00—  
\$150,000.00  
**P25503**

# **ARTEMIS PROJECT MANAGEMENT INFORMATION SYSTEMS**

**Product Type:** Turnkey System  
**Geographic Area Served:** Worldwide  
**Hardware Supported:** IBM 43XX Series, PC; Hewlett-Packard 1000, Series 100  
**Operating Systems:** RTE, MVS, MS-DOS  
**Languages:** ASSEMBLER, FORTRAN  
**Number of Clients/Users:** 550+

**Narrative:** ARTEMIS is a stand alone, turnkey computer system dedicated for use by project management. ARTEMIS relational database allows project management to be flexible and responsive to requirements and critical areas that are continually changing. ARTEMIS is used in over 90 applications, ranging from CPM scheduling to more specialized applications. Site inspections, extensive functional tests, training courses, and documentation are on-going services provided to each client. System upgrades, applications development and implementation, hardware service, and maintenance are all on-going services which are constantly being upgraded.

**Contact Data**  
Bruce Meyer  
Marketing Manager  
Metier Management Systems, Inc.  
5884 Point West Drive  
Houston, TX 77036  
Tele. 713-988-9100  
**Pricing**  
\$80,000.00  
**P12344**





**ASAPMS PROJECT MANAGEMENT SYSTEM**

**Product Type:** Applications Software  
**Geographic Area Served:** United States  
**Hardware Supported:** IBM 370, 30XX Series, 43XX Series, PC-XT; CDC; Prime; DEC PDP-11, VAX  
**Operating Systems:** VMS, RT-11, RSTS, MVS, PRIMOS  
**Languages:** Not Specified  
**Number of Clients/Users:** Not Specified  
**Narrative:** The ASA PMS is a project management system allowing the user to plan project schedules, to compare the project plant with actual job performance and to forecast of future time, manpower and cost requirements. It can also be used in a simulation mode to evaluate the impact of management decisions. ASA PMS Project Scheduling Library contains the Critical Path Method (CPM), Precedence Method (PDM), and Bar Chart Processing (Gantt). Modular in design, the system allows the user to select modules based on current needs. The five major programs include Scheduling, Resource, Cost, Multi-Project and Graphics. Additional features include: 1) On-line editing; 2) Report Writer; 3) What If simulation; 4) Multi-level network processing; 5) Report Control Routine; and 6) Report spooler routine.  
**Special Configuration Requirements:** 128KB memory, disk, 132-column printer, 80-column CRT, plotter (optional)  
**Contact Data**  
 Andrew Sipos  
 Manager  
 Andrew Sipos Associates (ASA)  
 355 South End Avenue  
 Suite 26B  
 New York, NY 10280  
 Tele. 212-321-2408

**Pricing**  
 \$9,000.00  
 and Up  
**PURCHASE**  
 \$450.00/MO.  
 and Up  
**LEASE**  
 P04186

**CPM**

**Product Type:** Applications Software  
**Geographic Area Served:** United States  
**Hardware Supported:** CPM-based Hardware  
**Operating Systems:** CPM  
**Languages:** FORTRAN  
**Number of Clients/Users:** Not Specified  
**Narrative:** CPM is a critical path method program that provides the normally required project management information such as Early Start, Late Start, Early Finish, Late Finish, Total Float and Free Float. Program maintenance terms: included.  
**Contact Data**  
 Inatome & Associates Inc.  
 1824 W. Maple Road  
 Troy, MI 48064-7104  
 Tele. 313-649-0910

**Pricing**  
 PRICE UPON  
 REQUEST  
 P16846

**CPM MGR.**

**Product Type:** Turnkey System  
**Geographic Area Served:** United States  
**Hardware Supported:** Data General Mini; IBM PC-AT  
**Operating Systems:** RDOS, SuperDOS  
**Languages:** BASIC  
**Number of Clients/Users:** New Product  
**Narrative:** CPM MGR. is a critical patch method scheduling aid which allows the user to interactively establish the network through input of work item numbers, descriptions and precedent data. The network is then generated and regenerated as changes are made. Infinite loops are directed. Work day calendars may be customized. Various time units may be used and changed within the network. Flexible output reports are created including work status reports, schedule reports and cost summaries. Results may be plotted in network or bar chart form.  
**Contact Data**  
 Joseph F. deSpautz  
 President  
 Applied Digital Communications  
 214 Flynn Avenue  
 Moorestown, NJ 08057  
 Tele. 609-234-3666

**Pricing**  
 \$15,000.00  
 and Up  
**PURCHASE**  
 P28215

**CRITICAL PATH ANALYSIS**

**Product Type:** Applications Software  
**Geographic Area Served:** United Kingdom  
**Hardware Supported:** Timex Sinclair ZX81  
**Operating Systems:** Not Specified  
**Languages:** Not Specified  
**Number of Clients/Users:** Not Specified  
**Narrative:** Given an arrow chart with nodes and activities numbered sequentially with activity cost and duration, the program will tabulate the early start, late finish, float for each activity and will list the nodes defining a critical path. Durations and costs may be modified and the process repeated. It is much simpler than our Project Planning Package, but it is useful for real applications and for training. Warranty: one year. Price of manual: included in price of program. Distribution media: tape.  
**Special Configuration Requirements:** 16 to 48K RAM  
**Contact Data**  
 Hilderbay Ltd.  
 8-10 Parkway  
 Regent's Park  
 London NW1 7AA  
 ENGLAND  
 Tele. 01-485 1059

**Pricing**  
 £13.04

P15062

**CRITICAL PATH MANAGEMENT SYSTEM (BAI\*PERT)**

**Product Type:** Applications Software  
**Geographic Area Served:** United States  
**Hardware Supported:** Hewlett-Packard 3000, 9000; DEC VAX; Texas Instruments 990 Series  
**Operating Systems:** VMS, MPE, DX10  
**Languages:** BASIC, FORTRAN  
**Number of Clients/Users:** 20  
**Narrative:** Features include: 1) Diagrams on DX10; 2) Project planning with PERT networks; 3) Project scheduling with Gantt charts; and 4) Resource management reports and annotated calendars. Projects are planned directly at the keyboard. No preprocessing or hand-drawn sketches are necessary. Maintenance is \$850.00 per year or \$250.00 per quarter. Training is \$1,000.00 per day plus expenses. The manual is individually priced at \$35.00.  
**Special Configuration Requirements:** 64K, graphics terminal, plotter interface board, plotter  
**Contact Data**  
 Emil Hirselj  
 President  
 Micro-Base Corporation  
 521 Windsor Park Drive  
 Dayton, OH 45459  
 Tele. 513-439-4560

**Pricing**  
 \$3,950.00  
**PURCHASE**

P22749

**CRITICAL PATH METHOD TASK SCHEDULING PROGRAM**

**Product Type:** Applications Software  
**Geographic Area Served:** Worldwide  
**Hardware Supported:** North Star Horizon, Advantage  
**Operating Systems:** North Star DOS, CP/M  
**Languages:** BASIC, Machine Code  
**Number of Clients/Users:** 100+  
**Narrative:** This program will allow the user to quickly determine the critical path in a project — that is, the longest path taken through a series of tasks of a project. This controls the total project length. The program also prints the dates of the early start, early finish, late start, late finish, total slack and free slack. It sets up schedules for projects to be done either in-house or being prepared for a bid to a client. It will show the scientific approach to arrive at a realistic schedule and will be impressive. The program is easy to use. Warranty/guarantee: 30 days. Program maintenance terms: six months. Training available: In the customer's office for \$250.00 per day; telephone support is \$10.00 per call. Manual availability: included in price of program. Distribution media: disk.  
**Special Configuration Requirements:** 48KB











**Operating Systems:** PC DOS, MS-DOS

**Languages:** BASIC

**Number of Clients/Users:** Not Specified

**Narrative:** Gantt-Pack is a business planning, scheduling and project management system. Data on tasks can be entered and changed to reflect shifting schedules and new tasks. Managers can see the status of all activities at a glance and immediately pick up when tasks are running late. If schedules change, Gantt-Pack revises charts. Menus, on-screen prompts and Help messages guide the user. Complete error-checking assures that data is correct and that no information is lost if a mistake is made. It can be used to plan and manage an office's renovation or move, schedule students in classes at a school, keep track of pending litigation and attorneys' schedules at a law firm, manage workflow in a machine shop or testing laboratory, schedule the operating rooms in a hospital, launch a new product, run a political campaign or manage an R & D project.

**Special Configuration Requirements:** 256K memory, two hard or floppy disks, 132-column printer

**Contact Data**

Gary B. Hirsch  
Vice President of Marketing  
Gantt Systems, Inc.  
495 Main Street  
Metuchen, NJ 08840  
Tele. 201-494-7452

**Pricing**  
\$225.00

P25772

**HARVARD PROJECT MANAGER**

**Product Type:** Applications Software

**Geographic Area Served:** United States, Canada, United Kingdom, Europe

**Hardware Supported:** IBM PC, PC-XT; MS-DOS-based Hardware

**Operating Systems:** PC DOS, MS-DOS

**Languages:** Not Specified

**Number of Clients/Users:** 10,000 +

**Narrative:** The Project Manager is a productivity tool for managers and professionals who are involved in scheduling, tracking and controlling of all sizes. It allows the user to develop the project on screen by producing a picture of the network showing task precedences and depicting the critical path (PERT diagram). A Gantt chart is also produced. Sub-project capability is available, and a wide variety of status reports can be developed.

**Special Configuration Requirements:** 128K memory (192K recommended)

**Contact Data**

Christine Eyre  
Product Manager  
Harvard Software, Inc.  
521 Great Road  
Littleton, MA 01460  
Tele. 617-486-8431

**Pricing**  
\$395.00  
PURCHASE

P23863

**HARVARD TOTAL PROJECT MANAGER**

**Product Type:** Applications Software

**Geographic Area Served:** United States, Canada, United Kingdom, Europe

**Hardware Supported:** IBM PC, PC-XT, PC-AT; MS-DOS-based hardware

**Operating Systems:** PC DOS, MS-DOS

**Languages:** Not Specified

**Number of Clients/Users:** Not Specified

**Narrative:** The Total Project Manager is a comprehensive business software tool for managers and professionals. The user can build a roadmap or project network to show task and milestone relationships and define critical path activities. Simultaneously, it creates a project schedule or Gantt Chart showing each activity in a time line. Advanced resource capability allows the user to create a pool of the company's resources and allocate them across all the projects. It also communicates project details graphically, producing roadmap, schedule, resource and cost reports.

**Special Configuration Requirements:** 384K memory

**Contact Data**

Christine Eyre  
Product Manager  
Harvard Software, Inc.  
521 Great Road  
Littleton, MA 01460  
Tele. 617-486-8431

**Pricing**  
\$495.00  
PURCHASE

P25782

**HORNET 4000**

**Product Type:** Applications Software

**Geographic Area Served:** Worldwide

**Hardware Supported:** IBM PC, PC-XT; Hewlett-Packard Series 100; DEC Rainbow; Wang PC; ACT Apricot

**Operating Systems:** MS-DOS

**Languages:** BASIC, ASSEMBLER

**Number of Clients/Users:** 800 +

**Narrative:** HORNET is an interactive project planning and management system. It uses precedence network techniques to produce date schedules, bar charts, resource loading schedules and histograms. It is designed for non-skilled operators and will handle, in any one project, up to several thousand activities and 128 different resources. It has three calendar options and permits sophisticated resource manipulation to produce S-curves, cash flows, etc. Integral resource spreadsheet is also included. HORNET's own report generator facilitates the precise tailoring of all reports to suit specific needs. An interactive link to many different data bases is included. HORNET is easy to update and encourages quick testing of alternative solutions. Warranty is for 12 months. Training is \$275.00 per day plus expenses.

**Contact Data**

Roy Stephenson  
Marketing Director  
Claremont Controls Limited  
Albert House  
Rothbury  
Morpeth, Northumberland NE65 7SR  
ENGLAND  
Tele. 0669 21081

**Pricing**  
\$2,750.00  
PURCHASE

P13414

**INFORMATICS DUE DATE MONITORING SYSTEM**

**Product Type:** Applications Software

**Geographic Area Served:** United States, Canada, United Kingdom, South Africa

**Hardware Supported:** IBM System/34, System/36, System 23

**Operating Systems:** SSP, Datamaster DOS

**Languages:** RPG, BASIC

**Number of Clients/Users:** 332

**Narrative:** The Due Date Monitoring System is designed to act as a "tickler" file. Scheduled tasks may be pulled in a variety of ways to ensure that all necessary work is being done. Work may be input as planned or currently in process. When setting up tasks, they may also be input as recurring or special tasks. Recurring tasks will be automatically generated by the system, thereby eliminating the need for repetitive data entry. Once tasks have been input, they may be analyzed in a variety of ways including by manager, customer, type of work, beginning date, due date, and hours budgeted. There is a 30-day money back guarantee. Program maintenance is 6 to 12 percent of the current purchase price.

**Special Configuration Requirements:** 64KB, disk drive

**Contact Data**

Chuck Carlson  
General Manager  
Informatics General Corporation  
P.O. Box 723597  
Atlanta, GA 30339  
Tele. 404-432-1996 or  
800-241-3306

**Pricing**  
PRICE UPON  
REQUEST

P08449

**INTEPERT**

**Product Type:** Applications Software

**Geographic Area Served:** United States, Canada, France, Scandinavia, Australia/New Zealand, Brazil

**Hardware Supported:** IBM PC, PC-XT, PC-AT; MS-DOS-based Hardware

**Operating Systems:** PC DOS, MS-DOS

**Languages:** ASSEMBLER





**Number of Clients/Users:** Not Specified

**Narrative:** IntePert™ is a multi-dimensional critical path scheduling program with the ability to transfer 26 resources in amounts ranging from 1/100th to 9,999 units. IntePert allows 120 tasks per level and 64 levels per task, for a total of 1,500 tasks. IntePert features Pert, Gantt, time, resource and task charts. Data can be transferred directly to InteCalc for job-costing and to IntePlan for display on the calendar. Durations can be days, weeks, months or years. Mandatory begin and/or end dates can be specified as desired.

**Special Configuration Requirements:** 128K memory, two disk drives, monochrome monitor, printer recommended

**Contact Data**

Diane Sipes  
 Director of Marketing  
 Schuchardt Software Systems, Inc.  
 515 Northgate Drive  
 San Rafael, CA 94903  
 Tele. 415-492-9330  
 Telex 296-177 SSSUSUR

**Pricing**  
 \$249.00

P19266

**MANAGEMENT™**

**Product Type:** Applications Software

**Geographic Area Served:** United States

**Hardware Supported:** IBM PC; Radio Shack I/III, II, IV, 12/16; CP/M-based Hardware

**Operating Systems:** PC DOS, TRSDOS, NEWDOS, DOS Plus, CP/M, LDOS

**Languages:** BASIC

**Number of Clients/Users:** 50

**Narrative:** ManageMint™ is ISA's menu-driven project control system. Its PERT/CPM is comparable in many respects to systems found on mainframe computers, while providing the quick turn-around and ease-of-use typical of microcomputer software. It provides all of the facilities necessary to plan and track schedules, budgets and resources. The 8-bit version of the program handles up to 999 tasks, 50 holidays and 1,200 working days. The 16-bit version has larger capacity with the exact capacity depending on available memory. Up to 26 resources and a budget are tracked. Up to four resources and a budget may be assigned to each task. Program maintenance terms: user support is at no cost; program updates are periodically made available. Manual availability: Included in price of program; priced separately at \$40.00. Distribution media: disk.

**Special Configuration Requirements:** 64KB memory, disk drive

**Contact Data**

Dr. Dennis Polis  
 President  
 ISA  
 36 E. Baltimore Pike  
 Suite 106A  
 Media, PA 19063  
 Tele. 215-566-0801

**Pricing**  
 \$395.00  
 Optional  
 Modules:  
 \$300.00

P21428

**MANAGER PROGRAM COLLECTION™**

**Product Type:** Applications Software

**Geographic Area Served:** United States

**Hardware Supported:** MS-DOS-based Hardware

**Operating Systems:** MS-DOS

**Languages:** Not Specified

**Number of Clients/Users:** Not Specified

**Narrative:** The Manager Program Collection consists of three programs, each aimed at a critical aspect of project management: critical path analysis, time, and records. Project Manager, is a project scheduling program which uses critical path analysis. Task Manager (formerly Time Manager), is an electronic calendar, appointment book, notebook, and expense journal. Records Manager, a cardfile data base, lets the user arrange personnel, inventory, and resources in ways he selects.

**Contact Data**

Datamension Corporation  
 615 Academy Drive  
 Northbrook, IL 60062  
 Tele. 312-564-5060

**Pricing**  
 \$499.00

P24032

**MAPPS — MANAGEMENT AND PROJECT PLANNING SYSTEM AND GRAF/PLOT**

**Product Type:** Applications Software

**Geographic Area Served:** Worldwide

**Hardware Supported:** DEC VAX; Data General MV Series; Wang VS; UNIX-based Hardware

**Operating Systems:** VMS, UNIX

**Languages:** PASCAL, BASIC

**Number of Clients/Users:** 200 +

**Narrative:** MAPPS gives managers a tool for controlling time, resources, and costs using CPM scheduling for network development. Both interactive and responsive, MAPPS reflects actual updated project data on the CRT or in printed form with text and graphics tailored for different project members. GRAF/PLOT creates full-color graphic representations of project data. Bar charts, line graphics, pie charts, network diagrams, and cash flow plots are provided. There is a 90-day warranty.

**Special Configuration Requirements:** DEC: 128K, Wang VS, Segment 2: 512K

**Contact Data**

Mark Leonard  
 Vice President  
 Mitchell Management Systems, Inc.  
 Westborough Office Park  
 2000 W. Park Drive  
 Westborough, MA 01581  
 Tele. 617-366-0800  
 TWX 710-347-1054

**Pricing**  
 \$50,000.00  
 MAPPS  
 \$15,000.00  
 GRAF/PLOT  
 PURCHASE

P14124

**MARK III MANAGEMENT SYSTEM**

**Product Type:** Applications Software

**Geographic Area Served:** United States, Europe

**Hardware Supported:** IBM 360/370, 30XX Series, 43XX Series; Honeywell Mainframe; Burroughs Mainframe; Sperry Series 1100; CDC; Xerox; General Electric; Cray; DEC PDP-11, VAX; Data General Eclipse, Nova, MV Series; Convergent Technologies

**Operating Systems:** MCP, NOS, CTOS, VMS, RSTS-E, AOS, RDOS, IBM DOS, IBM OS, 1100 OS, UCSD-p System

**Languages:** FORTRAN, COBOL, PASCAL

**Number of Clients/Users:** 50

**Narrative:** The Mark III Management System is designed as a completely automated management tool for the planning, scheduling and cost/performance control of multi-task projects. Mark III utilizes a digital or electrostatic black-and-white, or color plotter to generate project schedule charts and resource graphs, using a simple, Gantt-type barchart format for presentation, analysis and utilization. Primary applications are areas of operation that involve the monitoring of many closely-related and interdependent tasks. Detail, selective or summary project schedules, resource allocations and financial requirements and commitments are quickly developed and interrelated. Schedule progress, resourcing, earned value and cost/performance variance are calculated and displayed. Mark III can be applied and is successfully used in many fields including government, defense, aerospace, shipbuilding, construction, research and development and general industrial projects.

**Contact Data**

Francis M. Kavanagh  
 President  
 Program Control Corporation  
 7120 Hayvenhurst Avenue  
 Hathaway Building  
 Suite 401  
 Van Nuys, CA 91406  
 Tele. 818-782-2900

**Pricing**  
 PRICE UPON  
 REQUEST

P04185

**MICROGANTT™**

**Product Type:** Applications Software

**Geographic Area Served:** Canada, Switzerland, South Africa

**Hardware Supported:** IBM PC, PC-XT; DEC Professional 300s; Texas Instruments Professional; Wang Professional; Victor 9000

**Operating Systems:** PC DOS, CP/M, MS-DOS

**Languages:** BASIC

**Number of Clients/Users:** 800 +

**Narrative:** MicroGANTT is an Interactive general purpose project scheduling program that allows experienced or novice computer





users to create a professional quality project plan which includes a detailed critical path network. The program is limitless in its range of applications, and can handle very large projects as well as smaller projects. MicroGANTT lets the user scroll forward or backward through time to examine worker/time allocation, time and material outlays, and task dependencies. The user can change the timeframe to present varying levels of detail. With MicroGANTT, the user can track actual progress, make the needed adjustments and maintain an optimal schedule. The manual is included in price of program and is priced separately at \$25.00.

**Special Configuration Requirements:** 128K RAM, disk drive, printer, IBM PC compatibles

**Contact Data**  
 Patricia Thorp  
 Marketing Director  
 Earth Data Corporation  
 P.O. Box 13168  
 Richmond, VA 23225  
 Tele. 804-231-0300

**Pricing**  
 \$395.00

P22305

**MICROMAN PROJECT CONTROL SYSTEM (MPCS)**

**Product Type:** Applications Software  
**Geographic Area Served:** United States, Canada  
**Hardware Supported:** IBM PC; MS-DOS-based Hardware  
**Operating Systems:** VM/CMS, PC DOS, UNIX, CP/M, MS-DOS  
**Languages:** COBOL  
**Number of Clients/Users:** 14

**Narrative:** MicroMan Project Control System is a full feature project management and control system designed for the problems and complexities of managing a data processing environment. MicroMan supports the creation of up to 10,000 individual tasks per project. Features of the system include: project maintenance, resource maintenance, time and cost accounting, automatic CPM project scheduling, extensive project control and management reporting, and a generalized report writer. MicroMan is designed to support and control activities from the smallest problem report to a major project. Up to eight hours of training is provided with purchase.

**Special Configuration Requirements:** 256K, 10MB hard disk, color or monochrome monitor

**Contact Data**  
 Sally Jacobs  
 Vice President  
 POC-IT Management Services, Inc.  
 606 Wilshire Boulevard  
 Suite 606  
 Santa Monica, CA 90401  
 Tele. 213-393-4552

**Pricing**  
 \$5,000.00  
 PURCHASE

P24746

**MILESTONE**

**Product Type:** Applications Software  
**Geographic Area Served:** Worldwide  
**Hardware Supported:** IBM PC; Hewlett-Packard Micro; DEC Rainbow; Apple; North Star; Xerox; Eagle; Zenith; NEC PC8000; TeleVideo; Morrow Decision; KAYPRO; Epson; CP/M-based Hardware; MS-DOS-based Hardware  
**Operating Systems:** PC DOS, CP/M, CP/M-86, MS-DOS  
**Languages:** PASCAL  
**Number of Clients/Users:** Not Specified

**Narrative:** Milestone is a project management and time scheduling program which uses a critical path network analysis process to schedule manpower, dollars and time. Milestone can be used by executives, engineers, managers or business persons to produce a PERT chart in minutes, investigate the effects of changes of manpower for a completion date on the total project, draw up cost estimates, and in general, help communicate schedules and ideas to subordinates or supervisors. The Time Schedule Display allows the user to visually follow the activities in the project and instantly view the results of changes. The printed project schedules summarize every aspect of the project. Authorized returns must be made within 30 days of receipt of the product.

**Special Configuration Requirements:** CP/M: 56K RAM; Others: 128K RAM

**Contact Data**

Digital Marketing Corporation  
 2363 Boulevard Circle  
 Walnut Creek, CA 94595  
 Tele. 415-947-1000 or  
 800-826-2222  
 Telex 17-1852

**Pricing**  
 \$250.00  
 PURCHASE

P13301

**MILESTONE™**

**Product Type:** Applications Software  
**Geographic Area Served:** Worldwide  
**Hardware Supported:** Vector Graphic  
**Operating Systems:** CP/M, CP/M-86  
**Languages:** Machine Code  
**Number of Clients/Users:** Not Specified

**Narrative:** MILESTONE™ is a software package for scheduling manpower, dollars, and time to maximize productivity. It brings the power of critical path analysis to the small business world and the desktop microcomputer. It quickly and easily provides information on when a project will be completed, how much it will cost, current project status, and the effects of any changes. An interactive management tool, MILESTONE is menu-driven and treats each project as a series of activities. It is possible to plan and track a project with nearly 200 separate activities on a 64K computer without accessing disk memory. MILESTONE creates a graphic time-line chart of a project to identify time-critical activities that cannot be delayed. Printed management reports and charts are created by MILESTONE. Warranty/guarantee: 90 days. Manual availability: included in price of program. Distribution media: disk.

**Special Configuration Requirements:** Minimum of 64K RAM, one 630K disk, printer

**Contact Data**  
 Jeff Erickson  
 Software Marketing Manager  
 Vector Graphic, Inc.  
 500 N. Ventu Park Road  
 Thousands Oaks, CA 91320  
 Tele. 805-499-5831

**Pricing**  
 \$295.00  
 PURCHASE

P18182

**N5500 PROJECT MANAGEMENT SYSTEM**

**Product Type:** Applications Software, Interactive Processing  
**Geographic Area Served:** Worldwide  
**Hardware Supported:** IBM Mainframe, System/38; Honeywell Level 66, Level 62, DPS 8; Burroughs B5900 thru B7000; Sperry Series 1100; CDC Cyber Series; Hewlett-Packard 3000; Prime; DEC VAX; Data General Eclipse; Wang VS; Perkin-Elmer 3200 Series; Toshiba  
**Operating Systems:** MCP, VMS, AOS, AOS/VS, GCOS, GCOS 8, MPE, IBM DOS, MVS, VM, PRIMOS, 1100 OS, VS/OS  
**Languages:** COBOL  
**Number of Clients/Users:** 750 +

**Narrative:** N5500 is an integrated software tool which aids managers in resource and network scheduling, plan simulation, cost tracking, performance analysis and project documentation. The system uses both PERT and Precedence networking (user discretion) to test the impact of new or replanned work on all or part of the project universe. The system calculates start/finish dates (early, expected, late), plan variations, actual and forecast costs and a wide variety of other types of project information. Optional modules provide for online entry/retrieval of data, plotter graphics, report writer capability, I/J Input and more highly detailed project networks. A one-year warranty includes unlimited consultation and all general releases. Training is provided.

**Special Configuration Requirements:** 170K internal memory

**Contact Data**  
 Marketing Department  
 Nichols & Company, Inc.  
 5839 Green Valley Circle  
 Suite 104  
 Culver City, CA 90230  
 Tele. 213-670-6400

**Pricing**  
 \$30,000.00  
 PURCHASE  
 \$1,500.00/MO.  
 12-MO. Minimum  
 LEASE  
 P01213





**ONTIME PROJECT MANAGEMENT SYSTEM**

**Product Type:** Applications Software  
**Geographic Area Served:** United States  
**Hardware Supported:** Apple II Series  
**Operating Systems:** Apple DOS 3.3  
**Languages:** BASIC  
**Number of Clients/Users:** Not Specified  
**Narrative:** OnTime works with the manager's style to establish critical path schedule for each task. Projecting cost figures, keeping tabs on actual costs and immediate notification of schedule problems are some ways OnTime helps to control projects. A troubleshooting feature allows "what if" scenarios. CPM scheduling of up to 250 tasks can be accommodated. Task cost estimation, resource allocation analysis and project documentation features are included. Manual is provided; priced separately at \$35.00.  
**Special Configuration Requirements:** 48K, two floppy disk drives, 80-column printer

**Contact Data**  
 C. B. Taylor  
 Secretary  
 InfoTool Corporation  
 Drawer 809  
 Poulsbo, WA 98370  
**Tele.** 206-779-9508

**Pricing**  
 \$275.00  
**PURCHASE**

P25534

**OPTIONWARE™ ACTIVITY REPORTS**

**Product Type:** Applications Software  
**Geographic Area Served:** United States, Canada, Central/South America, Australia/New Zealand, South Africa, Middle East, United Kingdom, Europe, Scandinavia  
**Hardware Supported:** IBM PC; MS-DOS-based Hardware  
**Operating Systems:** PC DOS, MS-DOS  
**Languages:** Not Specified  
**Number of Clients/Users:** Not Specified  
**Narrative:** Activity Reports features an activity control system for tracking daily, weekly and monthly tasks and activities. It tracks up to 23 separate activities; records may be sorted by priority and due dates for any of the categories; provides a summary of key support and company information on financials and personnel by department; summarizes current and prior period activities and provides three task analysis areas and client information; and sets personal and company information using a parameter screen to allow change of headings, titles and variable data. Reports include: 1) "To Do" and Activity Reports; 2) Weekly Calendar; 3) Supply List; 4) Task Analysis Reports; 5) Client Time Breakdown; 6) Monthly Time Summary; and 7) Worksheet Areas. (G03-4)

**Contact Data**  
 Dennis Mochon  
 Communications Manager  
 OptionWare Incorporated  
 Corporate Place, 4 Barnard Lane  
 Bloomfield, CT 06002  
**Tele.** 203-243-5554

**Pricing**  
 \$99.95

P25534

**OPTIONWARE™ EMPLOYEE TIME REPORTING**

**Product Type:** Applications Software  
**Geographic Area Served:** United States, Canada, Central/South America, Australia/New Zealand, South Africa, Middle East, United Kingdom, Europe, Scandinavia  
**Hardware Supported:** IBM PC  
**Operating Systems:** Not Specified  
**Languages:** Not Specified  
**Number of Clients/Users:** Not Specified  
**Narrative:** Employee Time Reporting features an analysis of hourly time and charge rates for jobs, projects or clients. It tracks up to twelve different jobs and charge rates for chargeable and non-chargeable employee time for up to six weeks; provides a summary of key information, a comparison of current month data vs prior month and analyses for hourly and dollar allocations; breaks down key items using a worksheet area section; and sets personal information and charge rates using a parameter screen to change headings and titles. Reports include: 1) Summary reports; 2) Time Analysis for six weeks; 3) Calendar Screens; 4) Decimal Conversion Table; 5) Comparison Analysis; and 6) User-Prepared Worksheet Area. (P04-4)

**Contact Data**

Dennis Mochon  
 Communications Manager  
 OptionWare Incorporated  
 Corporate Place, 4 Barnard Lane  
 Bloomfield, CT 06002  
**Tele.** 203-243-5554

**Pricing**  
 \$99.95

P25519

**OPTIONWARE™ EMPLOYEE TIME ANALYSIS**

**Product Type:** Applications Software  
**Geographic Area Served:** United States, Canada, Central/South America, Australia/New Zealand, South Africa, Middle East, United Kingdom, Europe, Scandinavia  
**Hardware Supported:** MS-DOS-based Hardware  
**Operating Systems:** PC DOS, MS-DOS  
**Languages:** Not Specified  
**Number of Clients/Users:** Not Specified  
**Narrative:** Employee Time Analysis features an analysis of hourly time and charge rates for employees by job or project. It tracks up to 10 employees and 12 different jobs or projects for chargeable and non-chargeable time for up to six weeks; provides a summary of key information, a comparison of current month data vs prior month and analyses for hourly and dollar allocations; breaks down key items using a worksheet area section; and sets personal information and charge rates using a parameter screen to allow change of headings, titles and variable data. (P02-4)

**Contact Data**  
 Dennis Mochon  
 Communications Manager  
 OptionWare Incorporated  
 Corporate Place, 4 Barnard Lane  
 Bloomfield, CT 06002  
**Tele.** 203-243-5554

**Pricing**  
 \$99.95

P25521

**PAC MICRO™ — PROJECT MANAGEMENT SYSTEM**

**Product Type:** Applications Software  
**Geographic Area Served:** Worldwide  
**Hardware Supported:** IBM PC, PC-XT, PC-AT; MS-DOS-based Hardware  
**Operating Systems:** PC DOS, MS-DOS  
**Languages:** Not Specified  
**Number of Clients/Users:** 1,500  
**Narrative:** PAC MICRO is a fast, critical path scheduler that is easy to use, powerful, and includes color graphics. It is menu driven, allowing the user to select exactly what is required at the press of a button. Different versions of a project network can be set up quickly. The user can schedule projects based on duration, effort or availability of resources. PAC MICRO takes into account holidays and exports data to Lotus 1-2-3 and WordStar. PAC MICRO is a graphics oriented project management system designed so the user doesn't have to wade through lengthy reports. Pie charts, bar charts and effective use of color all provide the visibility that is essential to the project planner or manager. PAC MICRO may be utilized on a standalone basis, or it may be interfaced to the mainframe PAC Project Management Systems.

**Contact Data**  
 AGS Management Systems, Inc.  
 880 First Avenue  
 King of Prussia, PA 19406  
**Tele.** 215-265-1550  
**TWX** 510-660-3320

**Pricing**  
 \$990.00  
 ONE-TIME  
 LICENSE FEE  
 \$25,000.00  
 SITE LICENSE  
 P21327

**PATHFINDER™**

**Product Type:** Applications Software  
**Geographic Area Served:** Worldwide  
**Hardware Supported:** IBM PC, PC-XT, PC-AT; MS-DOS-based Hardware  
**Operating Systems:** PC DOS, MS-DOS  
**Languages:** BASIC  
**Number of Clients/Users:** Not Specified  
**Narrative:** PATHFINDER is a tool for project planning using the Critical Path Method (CPM). Completely menu-driven, PATH-FINDER prompts the user in setting up projects with up to 3,160 activities while prioritizing the sequence of steps to be accomplished. The program has complete editing capabilities which





Include renaming, changing time required, deleting old entries and adding new ones, and it allows the user to update a project while it is underway and to recalculate the schedule. PATHFINDER will project the time to complete the project while charting the "critical path" and producing a time schedule (GANTT) chart.

**Special Configuration Requirements:** IBM PC compatibles

**Contact Data**

Charles Kroboth  
 Vice President  
 Morgan Computing Company,  
 Incorporated  
 P.O. Box 112730  
 Carrollton, TX 75011  
 Tele. 214-245-4763

**Pricing**  
 \$80.00

P17467

**PATHFINDER™: A MICROCOMPUTER SOFTWARE SYSTEM FOR PROJECT PLANNING AND SCHEDULING**

**Product Type:** Applications Software

**Geographic Area Served:** Worldwide

**Hardware Supported:** IBM PC; Hewlett-Packard Series 100; Apple II Series; Radio Shack TRS-80; Xerox 820

**Operating Systems:** CP/M

**Languages:** FORTRAN

**Number of Clients/Users:** 50+

**Narrative:** PATHFINDER™ accommodates the Critical Path Method of project planning and scheduling to small, easy-to-use, inexpensive microcomputers, enhancing the four-in-one program's user-friendliness, speed, and scope of applications via a requisite CP/M operating system, allowing the project manager, inexperienced in computers, to use the most modern techniques to gain information recently available only from large computer operations or services. With 48K, PATHFINDER™ can schedule, monitor, review, and revise projects consisting of as many as 500 activities. The Reports feature quickly provides a full range of easily understood data for optimum results: 1) Exception reports spot critical points; 2) Gantt charts portray status of each step; 3) Schedule reports allow instant modifications; 4) Cash-flow reports ease financial planning; and 5) "What-if" scenarios explore solutions to any problems encountered. Warranty/guarantee: full refund upon return of disk and manual. If, after consultation with supplier-provided technical support, program is deemed inapplicable to user's needs or equipment. Program maintenance terms: updating is free of charge to registered purchasers. Manual availability: included in price of program. Distribution media: 5.25 inch or 8 inch floppy disk.

**Special Configuration Requirements:** 48K, two floppy disk drives, 132-character printer, CRT terminal, most CP/M based micros

**Contact Data**

Warren Charles  
 Software Marketing  
 Garland Publishing, Inc.  
 136 Madison Avenue  
 New York, NY 10016  
 Tele. 212-686-7492  
 Telex 424588

**Pricing**  
 \$299.00

P14830

**PENTONPROJECT**

**Product Type:** Applications Software

**Geographic Area Served:** United States

**Hardware Supported:** IBM PC, PC-XT; MS-DOS-based Hardware; UCSD p-System-based

**Operating Systems:** PC DOS, MS-DOS, UCSD-p System

**Languages:** PASCAL

**Number of Clients/Users:** 300

**Narrative:** PentonProject is a powerful project management program using the principles of critical path analysis in a flexible, interactive environment. PentonProject enables project managers to map out networks, prepare project schedules using CPM and bar charts, track and update schedules, develop project budgets, track and control individual costs, monitor work in progress, level resources (by individual projects or among projects), generate printed status reports, ask "what if" questions, diagnose schedule and resource needs, develop comprehensive work breakdown structures and electronically transfer data to and from Lotus 1-2-3, dBASE II/III, and other popular programs. PentonProject includes

a Project Editor that allows subprojects to be stored in a library which can be accessed in the future to help form new projects. The detailed graphics enables professional reports to be produced. PentonProject also enables color charts to be produced using its optional Pen Plotter software.

**Contact Data**

Jonathan Wiener  
 Sales Manager  
 Penton Software, Inc.  
 420 Lexington Avenue  
 Suite 2846  
 New York, NY 10017  
 Tele. 212-878-9600 or  
 800-221-3414  
 TWX 910-350-6115

**Pricing**  
 \$1,595.00

P27252

**PERSONAL TASK MANAGER (P.T.M.)**

**Product Type:** Applications Software

**Geographic Area Served:** Worldwide

**Hardware Supported:** IBM PC; MS-DOS-based Hardware

**Operating Systems:** MS-DOS, PC DOS

**Languages:** BASIC

**Number of Clients/Users:** Not Specified

**Narrative:** P.T.M. is designed to aid in "getting organized and getting more done in less time." P.T.M. allows the user to create, save, edit or print lists of "things to do", and will even calculate a project's completion time. P.T.M. can even handle long-range planning. Automatic help messages provided, along with clear option and error messages. Can be used by one or many individuals. A one-year warranty is included.

**Special Configuration Requirements:** 96K, 80-column printer

**Contact Data**

Lyn J. Durant  
 Marketing Director  
 Generic Computer Products, Inc.  
 P.O. Box 790  
 Department ID-105  
 Marquette, MI 49855  
 Tele. 906-249-9801

**Pricing**  
 \$49.95  
 PURCHASE

P28002

**PERSONNEL AND ACTIVITY MANAGEMENT SYSTEM™ (PAMS)**

**Product Type:** Applications Software

**Geographic Area Served:** United States

**Hardware Supported:** Fujitsu; IBM PC, PC-XT

**Operating Systems:** PC DOS

**Languages:** Not Specified

**Number of Clients/Users:** New Product

**Narrative:** Personnel and Activity Management System™ (PAMS) is a tool for project and resource management designed to suit the needs of today's executives. PAMS is easy-to-learn and easy-to-use, and adapts to the changing needs of any organization. Specifically, PAMS is a management control tool that enables the user to: 1) Monitor projects and activities through the total development life cycle with complete control including automatic project estimation and forecasting; 2) Collect historical performance and cost data at the overall project level, individual task level, and employee level; 3) Provide critical path and project variance reporting together with full department chargeback and allocation capabilities; 4) Display both historical and forecast information in graphic representation; 5) Establish standards of performance upon which projects and personnel can be measured; 6) Forecast performance based on previous efforts against the standard; and 7) Provide critical personnel information to maximize a productive environment. Price includes software, full documentation, one day of on-site installation support and training (expenses billed separately), and a one year warranty.

**Special Configuration Requirements:** 128KB, two floppy disk drives or floppy drive and a hard disk

**Contact Data**

The Lloyd/Harvey Corporation  
 18319 Delano Street  
 Suite 100  
 Reseda, CA 91335  
 Tele. 213-881-7387

**Pricing**  
 \$3,500.00

P22479





**PERT6**

**Product Type:** Applications Software  
**Geographic Area Served:** United States, United Kingdom, Canada  
**Hardware Supported:** DEC System 10-20, VAX; Alpha Micro  
**Operating Systems:** AMOS, TOPS 10, TOPS 20, VMS  
**Languages:** ASSEMBLER, FORTRAN  
**Number of Clients/Users:** 30

**Narrative:** PERT6 is a management information system intended for use in project management. It consists of a number of routines that access the same data base. The routines are typically scheduling routines, updating routines, reporting routines, etc. The salient features of PERT6 are: 1) User-defined reports; 2) Standard set of reports; 3) Easy updating; 4) Resource leveling; 5) Phase/milestone reporting; 6) Cost reporting; 7) Automatic or manual scheduling with user choice or i-j or predecessor-successor notation; 8) Can be linked to other reporting systems; 9) Subnetwork capability; 10) Window reports; 11) Automatic multiple calendars; and 12) Time card recording. Maintenance is included in the purchase price.

**Contact Data**  
Mr. A. J. Paris  
Vice President of Marketing  
Dynamic Solutions Inc.  
50 Lytton Avenue  
Hartsdale, NY 10530  
Tele. 914-949-6058

**Pricing**  
PRICE UPON  
REQUEST

P01001

**PERTMASTER**

**Product Type:** Applications Software  
**Geographic Area Served:** Worldwide  
**Hardware Supported:** IBM PC; CP/M-based Hardware; MS-DOS-based Hardware  
**Operating Systems:** PC DOS, CP/M-80, MS-DOS  
**Languages:** BASIC  
**Number of Clients/Users:** 13,000

**Narrative:** Pertmaster is a menu-driven, critical path analysis management tool used in optimizing the use of time, people and resources. The system includes provisions for sub-networks, merging, 29 resources/project, resource and descriptive coding. Both arrow (I-J) and precedence network formats are supported. To create either network, only the description, sequence, duration, resource needs, costs and deadlines are entered for each activity. What-if network conditions with different user-defined calendar and abbreviation file alternatives can be experimented with. A variety of reports on schedules and resources are available at several management detail levels with many sorting and report options.  
**Special Configuration Requirements:** CP/M-80: 64K memory; MS-DOS: 256K memory; 132-character printer

**Contact Data**  
Sales Department  
Westminster Software, Inc.  
2570 El Camino Real  
Suite 400  
Mountain View, CA 94040  
Tele. 415-941-6800  
TWX 490-0000073

**Pricing**  
\$695.00—  
\$895.00  
PURCHASE

P21824

**PEST — PROJECT ENGINEERING SCHEDULING TECHNIQUE**

**Product Type:** Applications Software  
**Geographic Area Served:** United Kingdom, Europe  
**Hardware Supported:** DEC VAX; IBM 30XX Series, PC  
**Operating Systems:** VMS, MVS, PC DOS  
**Languages:** FORTRAN  
**Number of Clients/Users:** 4

**Narrative:** PEST, based on Harwell's WASP program, is a management aid program that solves the problem of how to assign staff to projects when they are handling more than one project at the same time. The program schedules staff time so that they are fully occupied and at the same time not so overloaded as to cause delays to any of the projects for which they are responsible. PEST is designed for assigning engineering staff but is also suited for designers, quantity surveyors, inspectors and sales personnel.

**Contact Data**

L. B. Cousins  
Commercial Manager, Computer Applications  
AERE Harwell  
Didcot, Oxfordshire OX11 0RA  
ENGLAND  
Tele. (0235) 24141 Ext. 2205  
Telex 83135 ATOMHA G

**Pricing**  
\$6,000.00  
LICENSE

P27614

**PLANNING PRIORITY SYSTEM (PPS), THE**

**Product Type:** Applications Software  
**Geographic Area Served:** United States, Canada, United Kingdom, West Germany, Australia/New Zealand, South Africa  
**Hardware Supported:** IBM PC, PC-XT; Apple II Series, III; Victor; ACT Sirius  
**Operating Systems:** PC DOS, MS-DOS  
**Languages:** BASIC, C Language, PASCAL  
**Number of Clients/Users:** 120

**Narrative:** PPS is a rational project and overall planning system for managers and trainers. From managers' raw views and data on any relevant factors, it calculates plans and evaluates performance accordingly. Managers in business and public services may use it to foresee consequences of decisions, reconcile conflicting claims and demands and achieve aims within constraints. A one-year warranty is included. Manual is included; priced separately at £20.50. Training is available in the supplier's office for £300 or in the customer's office for £350.

**Special Configuration Requirements:** Apple: 48K memory, Others: 128K memory

**Contact Data**  
Miss T. A. Bamford  
Marketing Director  
Work Sciences Associates  
26 Southwood Lawn Road, Highgate  
London N6 5SF  
ENGLAND  
Tele. 01-348 5822

**Pricing**  
£394.40  
PURCHASE

P25952

**PLANTRAC™**

**Product Type:** Applications Software  
**Geographic Area Served:** Worldwide  
**Hardware Supported:** IBM PC, PC-XT, PC-AT; Wang Professional; Radio Shack 12/16; Zenith Z100s; Convergent Technologies; ITT XTRA; AT&T 6300/7300; ACT Apricot; Texas Instruments Professional; CP/M-based Hardware; MS-DOS-based Hardware  
**Operating Systems:** PC DOS, TRSDOS, CP/M, MS-DOS, XENIX  
**Languages:** BASIC  
**Number of Clients/Users:** 1,200

**Narrative:** PLANTRAC is a comprehensive user-friendly and flexible project management software system which operates on a wide range of popular microcomputers. Menus and prompts easily guide the user through the following functions: 1) Critical path method network planning; 2) Time analysis; 3) Resource analysis; 4) Resource scheduling; 5) Cost analysis; 6) Flexible report writer; 6) Progress reporting; 8) Library; 9) Logic drawing and bar chart screen display and output to printer and plotters; and 10) Interfacing — it may be linked with other software systems. Software updates are free of charge. Manual is included; priced separately at \$60.00.

**Special Configuration Requirements:** 256K CPU; disk drive and a hard disk, 132 print position printer, plotter optional

**Contact Data**  
Susan Carroll  
National Manager  
Computerline Inc.  
755 Southern Artery  
Quincy, MA 02169  
Tele. 617-773-0001

**Pricing**  
\$3,000.00/  
1st YR.  
Renewal Fee:  
\$1,000.00/YR.  
LICENSE  
P19753

**PMS-II — CRITICAL PATH PROJECT MANAGEMENT SYSTEM**

**Product Type:** Applications Software  
**Geographic Area Served:** Worldwide  
**Hardware Supported:** IBM PC; CP/M-based Hardware; MS-DOS-based Hardware  
**Operating Systems:** PC DOS, CP/M, CP/M-86, MS-DOS





**Languages:** Not Specified

**Number of Clients/Users:** 1,500

**Narrative:** PMS-II is a full-scale critical path project management system and scheduling package, which calculates early and late start and finish; float and critical path(s) for networks of up to 1,250 activities in 64K or 2,700 activities in a 128K 16-bit machine. With its super- and sub-networking features, project size is unlimited. The system prints activity reports and Gantt charts with extensive sort and select capabilities, in addition to the activity diagram, funding schedule and graph and three-part earned value analysis reports and graph. PMS-II tracks budget and actual material, labor, and burden dollars and will interface to any job cost system, LOTUS 1-2-3, Symphony or dBASE II. It satisfies all Corps of Engineers ER 1-1-11 and baseline DOD 7000.2 specifications. Maintenance is free for the first year. A demonstration system is available for \$50.00.

**Special Configuration Requirements:** 64K memory, 600K disk storage, two drives or hard disk, 80x24 video display, 132-column printer

**Contact Data**

Ann Kalitzke  
 North America MICA, Inc.  
 5230 Carroll Canyon Road  
 Suite 110  
 San Diego, CA 92121  
 Tele. 619-458-1327  
 Telex 701257 NAMICA UD

**Pricing**  
 \$1,295.00  
 LICENSE

P17642

**PREMIS PC/WORKSTATION**

**Product Type:** Applications Software

**Geographic Area Served:** United States

**Hardware Supported:** IBM PC-XT

**Operating Systems:** MS-DOS

**Languages:** Not Specified

**Number of Clients/Users:** 3

**Narrative:** PREMIS PC WORKSTATION provides an alternative for data capture, data validation, small network resolution, report processing and inquiry. It is the perfect companion for using PREMIS from an IBM PC. It provides an alternative to using TSO for data entry needs, and includes all the features of TSO-based main-frame systems and also offers these enhancements: 1) Full ADD, CHANGE, DELETE and BROWSE capability for all transactions; 2) Complete on-line HELP facilities which can be called upon in the middle of a transaction; 3) Complete Job Creation; and 4) "HELP" instructions to aid in transmitting jobs to the host for processing using: IRMA, SMARTCOM or Blue Lynx.

**Special Configuration Requirements:** 128K memory, (two) 320K disk drives or hard disk

**Contact Data**

Kevin Smith  
 Project Management Services  
 SIS SunData  
 Two Glenhardie Corporate Center  
 1285 Drummers Lane  
 Wayne, PA 19087  
 Tele. 215-341-8797  
 TWX 510-668-0004

**Pricing**  
 \$995.00  
 PURCHASE

P24926

**PRIMAVERA™ PROJECT PLANNING-PPP**

**Product Type:** Applications Software

**Geographic Area Served:** United States

**Hardware Supported:** IBM PC; MS-DOS-based Hardware

**Operating Systems:** PC DOS, MS-DOS

**Languages:** Not Specified

**Number of Clients/Users:** Not Specified

**Narrative:** This software provides critical path method analysis, resource leveling and cost control for computer users. PPP will make project planning and control techniques available to a broader cross-section of users who need to accommodate up to 10,000-activity networks. It can be used also by defense, aerospace, Information system and construction firms.

**Contact Data**

Primavera Systems, Inc.  
 29 Bala Avenue  
 Suite 224  
 Bala Cynwyd, PA 19004  
 Tele. 215-667-8600

**Pricing**  
 \$2,500.00

P22466

**PROJECT CONTROL**

**Product Type:** Applications Software, Interactive Processing

**Geographic Area Served:** United States

**Hardware Supported:** DEC PDP-11; IBM PC; Radio Shack TRS-80

**Operating Systems:** RT-11, RSX-11, PC DOS, TRSDOS

**Languages:** FORTRAN, BASIC

**Number of Clients/Users:** 1

**Narrative:** The Project Control system is a management tool that facilitates the planning, monitoring and controlling of projects or contracts at the project, division and corporation level. The system also tracks staff utilization. Project managers can plan up to three years into the future for people time and a number of expense categories, along with total budgets for each. As the project progresses, actual resource usage is entered; up to three years history is maintained for each category. Monthly, weekly, or as required, reports provide status of actual used and planned information. The report also compares current category totals with the budget. Status reports show availability of staff for future project manning. All projects in a division are summarized in a division report; divisions summarized in a corporation level report.

**Contact Data**

Jerry Lisovich  
 Director  
 Datametrics  
 114 N. Beatty Street  
 Pittsburgh, PA 15206  
 Tele. 412-363-3282

**Pricing**  
 PRICE UPON  
 REQUEST

P10174

**PROJECT MANAGEMENT INFORMATION SYSTEM**

**Product Type:** Applications Software, Turnkey System

**Geographic Area Served:** United States, Canada, United Kingdom, Europe, Central/South America

**Hardware Supported:** Wang 2200; AT&T 3B Series, 6300/7300; IBM PC; COMPAQ; Fortune 32; DEC MicroVAX

**Operating Systems:** Wang DOS, PC DOS, ULTRIX, MS-DOS, UNIX

**Languages:** BASIC

**Number of Clients/Users:** 45

**Narrative:** The Project Management System is designed to aid in alleviating inaccurate costing and estimating that distort profitability figures, misquotes based on competition rather than true costs, use of common labor burden rates for all operations regardless of true costs, inability to judge backlog, lack of labor analysis to make best use of employee skills, and lack of historical information. It addresses the needs of architects, public relations and advertising agencies, collection firms, decorators, consultants, attorneys and similar project-oriented firms. The Project Management System accommodates user-defined reports and project data to meet the specific requirements of each user.

**Contact Data**

Donna Casselman  
 Director of Marketing  
 TOM Software, Inc.  
 P.O. Box 66596  
 Seattle, WA 98166  
 Tele. 206-246-7022  
 Telex 32-0011 (TOMSEA)

**Pricing**  
 PRICE UPON  
 REQUEST

P27266

**PROJECT MANAGER WORKBENCH**

**Product Type:** Applications Software

**Geographic Area Served:** United States

**Hardware Supported:** IBM PC, PC-XT, PC-AT; AT&T 6300/7300; ITT XTRA; Columbia; COMPAQ; NEC; Eagle; Panasonic; Zenith; Radio Shack; DEC Rainbow; Wang PC

**Operating Systems:** PC DOS, ZDOS, P/OS, MS-DOS

**Languages:** ASSEMBLER

**Number of Clients/Users:** Not Specified

**Narrative:** The Workbench is a micro software package specifically designed as a decision support system for the project manager. It integrates Gantt charts, CPM networks and resource allo-





cation spreadsheets; its multi-level planning hierarchy manages projects having both resource and dependency constraints. System features include What-If capabilities, time data capture, templating, work effort and cost status reporting, multi-project reporting, report preview with text editing and DIF and fixed format ASCII file interfaces to other systems. Cursor control to reconfigure a plan, cut-and-paste of activities across multiple projects and an optional single-keystroke Expert Mode are available. Both a manual tutorial and online tutorial as well as a menu hierarchy assist a new user.

**Special Configuration Requirements:** 384K memory, double-sided diskette drive, monochrome or color monitor, ASCII character printer, IBM DOS emulation board for Wang

<b>Contact Data</b>	<b>Pricing</b>
Applied Business Technology Corp.	\$750.00—
365 Broadway	\$1,150.00
New York, NY 10013	
<b>Tele.</b> 212-219-8945	P27029

#### **PROJECT MANAGER, THE**

**Product Type:** Applications Software

**Geographic Area Served:** United States

**Hardware Supported:** IBM PC

**Operating Systems:** IBM DOS

**Languages:** Not Specified

**Number of Clients/Users:** Not Specified

**Narrative:** The Project Manager critical path planning system allows managers to coordinate the various steps in a project's development and completion (up to 400 separate activities). Using color graphics to highlight critical points, it outlines the tasks which must be completed before any other work may proceed, points out which tasks can overlap, and identifies potential time traps that managers must closely supervise. A demonstration package is available for \$30.00.

**Special Configuration Requirements:** 64K, disk drive, monochrome or color monitor, matrix printer with "Graphtrax", or HP 7470A x-y plotter and asynchronous communications board with color graphics adapter

<b>Contact Data</b>	<b>Pricing</b>
Peter Clifton	\$295.00
Product Manager	PURCHASE
Wiley Professional Software	
605 Third Avenue	
New York, NY 10158	
<b>Tele.</b> 212-850-6009	P24614

#### **PROJECT PLANNER™**

**Product Type:** Applications Software

**Geographic Area Served:** United States

**Hardware Supported:** Apple II Series

**Operating Systems:** Apple DOS 3.3

**Languages:** Not Specified

**Number of Clients/Users:** Not Specified

**Narrative:** Project Planner offers all the basic capabilities of the critical path method and enables the user to plan, organize, schedule, control and monitor a project; focus on critical activities; play what-if to analyze alternatives; communicate with colleagues and clients; and improve presentations or proposals. At the core of Project Planner lies an automatic project graph filtering and generation capability. The user obtains complete project plans by listing activities and entering minimal predecessor information. Project Planner generates the flowchart and schedule automatically, filtering any inconsistent information. Essentially, Project Planner visualizes the project for the user and eliminates the need to prepare flowcharts prior to using the critical path method.

<b>Special Configuration Requirements:</b> 64K, two disk drives	
<b>Contact Data</b>	<b>Pricing</b>
Applitech Software, Inc.	\$195.00
381 Harvard Street	
Cambridge, MA 02138	
<b>Tele.</b> 617-497-8268	P25676

#### **PROJECT SCHEDULER NETWORK**

**Product Type:** Applications Software

**Geographic Area Served:** United States

**Hardware Supported:** IBM PC, PC-XT, PC-AT

**Operating Systems:** PC DOS

**Languages:** PASCAL

**Number of Clients/Users:** Not Specified

**Narrative:** Project Scheduler Network is a project management system designed to help management meet deadlines and beat cost targets through project forecasting, scheduling, control and tracking of project status. All data is entered into tables. Features include: 1) Critical path calculation; 2) Network diagrams which are easy to create; 3) Work breakdown structures (sub-tasking); 4) Sophisticated graphics displays and output to printer or plotter; 5) Spreadsheet interface; 6) Up to 2,000 tasks per project; 7) 96 user-defined resources; and 8) Detailed and summary reports.

**Special Configuration Requirements:** 320K minimum memory, two disk drives (one may be hard drive), Microsoft or compatible mouse, graphics card

<b>Contact Data</b>	<b>Pricing</b>
Linda Munsell	\$495.00
Marketing	PURCHASE
SCITOR Corporation	
250 Lincoln Centre Drive	
Foster City, CA 94404	
<b>Tele.</b> 415-570-7700	P26710

#### **PROJECT/2**

**Product Type:** Applications Software, Turnkey System

**Geographic Area Served:** United States, Canada, United Kingdom, Europe, Central/South America, Australia/New Zealand, Japan

**Hardware Supported:** IBM PC, PC-XT, 3270 PC, PC-AT; COMPAQ

**Operating Systems:** PC DOS, MS-DOS

**Languages:** Not Specified

**Number of Clients/Users:** 1,000 + /500

**Narrative:** PROJECT/2 is a tool for the project planner who uses automated, network-based project planning and control. User-defined English language commands eliminate the need for a knowledge of programming. Provided are network scheduling procedures and algorithms which go beyond the basic early start, late start calculations. Features include: 1) "Time now" progress reporting; 2) "What if" analysis; 3) Resource constrained scheduling; 4) Discontinuous and target scheduling; 5) Multi-project scheduling; and 6) Multiple-calendar scheduling. The PROJECT/2 Cost Processor integrates cost, resources and schedule, based on a hierarchical structure, and allows four work breakdown structures per project. The Cost module provides cash flow analysis, actual cost reporting for comparison to budget and earned value reports. PROJECT/2 Graphics interfaces with information stored in the Schedule and Cost modules to provide visual tools used in project management. The Relational Database Processor is based on SQL, a non-procedural language.

**Special Configuration Requirements:** 384K memory, disk drive, printer, plotter (optional), Tektronix terminal (optional)

<b>Contact Data</b>	<b>Pricing</b>
Mike Beringer	PRICE UPON REQUEST
Vice President of Sales	
Project Software & Development, Inc	
14 Story Street	
Cambridge, MA 02138	
<b>Tele.</b> 617-661-1444	P03904

#### **PROJECTOR**

**Product Type:** Applications Software, Local Batch Processing

**Geographic Area Served:** Worldwide

**Hardware Supported:** IBM PC; Apple II Series; MS-DOS-based Hardware

**Operating Systems:** Apple DOS 3.3, PC DOS, MS-DOS, CP/M

**Languages:** BASIC

**Number of Clients/Users:** Not Specified

**Narrative:** PROJECTOR provides an automated basis for project progress review by project managers. As the project progresses, its development cost is tracked, and productivity is measured. Network charts can be updated with accurate information and critical path sequences identified. Features include: 1) Definition, updating and display of planned projects and projects on hand; 2) Definition and control of component tasks of the project showing time and cost estimates together with skills necessary to carry out tasks; 3) Assignment of staff with appropriate skills to tasks;





4) Control of time and costs for individual tasks and signalling of those tasks which have overshot budgeted levels; 5) Documentation control to show which tasks have been properly specified; and 6) Maintenance of project staff records. Up to 16 projects can be handled simultaneously by the package with each project having up to 30 team members and up to 200 tasks. A one-year warranty is included.

**Special Configuration Requirements:** 64K memory, twin five-inch floppy disks, 80-column card, 80-column printer

<b>Contact Data</b>	<b>Pricing</b>
Mel Gosling	\$240.00
Senior Consultant	
Savant	
2 New Street	
Carnforth, Lancashire LA5 9BX	
ENGLAND	
<b>Tele.</b> 0524-734505	
<b>Telex</b> 65138 SAVANT G	P14854

**PROMAS**

**Product Type:** Applications Software  
**Geographic Area Served:** United States, Canada  
**Hardware Supported:** Alpha Micro  
**Operating Systems:** AMOS  
**Languages:** Not Specified  
**Number of Clients/Users:** 15  
**Narrative:** PROMAS is a Project Management and accounting system. The package is modularly designed, allowing it to be customized to suit the requirements of architects, contractors, custom manufacturers, and others. In addition to estimating, costing and accounting, the system provides full project control including resource allocation, critical path analysis, and cash flow. Project planning utilizes a spreadsheet-like screen and automatically updates budget and resource allocation files. There is a 90-day warranty with an ongoing update service available. Up to six days of training are included. Manual is provided; priced separately at \$30.00.

**Special Configuration Requirements:** 256K memory, 30MB disk  
**Contact Data**  
 Hugh A. Elms  
 TCP Business Systems  
 233 Carlaw Avenue  
 Toronto, Ontario M4M 3E9  
 CANADA  
**Tele.** 416-465-2495

**Pricing**  
 \$30,000.00

P22631

**PROTRACS**

**Product Type:** Applications Software  
**Geographic Area Served:** United States, Canada  
**Hardware Supported:** IBM PC, PC-XT, PC-AT; COMPAQ; Sperry Micro; Zenith  
**Operating Systems:** PC DOS  
**Languages:** ASSEMBLER, PASCAL  
**Number of Clients/Users:** Not Specified  
**Narrative:** PROTRACS is an interactive project and action-item tracking system. Projects are broken down into component tasks which can be prioritized and assigned to individuals responsible. These tasks are then tracked over time. Tasks can be quickly sorted for custom reporting. Overdue tasks can be highlighted on the screen or listed in report format. Six reports can be routed to disk, printer, or screen. Four Gantt charts can be created and scrolled on the screen to graphically depict the project's progress. PROTRACS can track up to 100 projects containing up to 100 tasks each.

**Special Configuration Requirements:** 256K memory  
**Contact Data**  
 Russell F. Still  
 Vice President  
 Applied MicroSystems, Inc.  
 P.O. Box 832  
 Roswell, GA 30077  
**Tele.** 404-475-0832

**Pricing**  
 \$59.95  
 LICENSE

P23673

**QUICK-PLAN**

**Product Type:** Applications Software  
**Geographic Area Served:** United States, Central/South America, United Kingdom, Europe, Australia/New Zealand  
**Hardware Supported:** IBM PC; Hewlett-Packard Series 100; DEC Rainbow; Texas Instruments Professional; Data General Desktop; Wang PC; MS-DOS-based Hardware  
**Operating Systems:** MS-DOS  
**Languages:** PASCAL  
**Number of Clients/Users:** New Product  
**Narrative:** Quick-Plan provides the decision support means via a personal computer for rapid, complete and effective control of the planning process. Quick-Plan uses the network-based, Critical Path Method (CPM) of modeling to control project time, costs and resource expenditures. Since Quick-Plan is a generic planning tool, it has a wide range of applications in almost any business environment. In addition to true modeling, Quick-Plan features ease of input, extensive editing capability, incredible processing speed and flexible, "tailored" print-outs and displays. There is a 30-day money-back guarantee and a 90-day warranty. A one-day seminar is included with purchase.

**Special Configuration Requirements:** 384K RAM, twin floppy or hard disk drive

<b>Contact Data</b>	<b>Pricing</b>
David P. Kenney	\$995.00
Product Manager	PURCHASE
Mitchell Management Systems, Inc.	
Westborough Office Park	
2000 W. Park Drive	
Westborough, MA 01581	
<b>Tele.</b> 617-366-0800	
<b>TWX</b> 710-347-1054	P25053

**QWIKNET**

**Product Type:** Applications Software  
**Geographic Area Served:** United States, Canada, United Kingdom, Europe, Central/South America, Australia/New Zealand, Japan  
**Hardware Supported:** IBM PC, PC-XT, 3270 PC, PC-AT; COMPAQ  
**Operating Systems:** PC DOS, MS-DOS  
**Languages:** Not Specified  
**Number of Clients/Users:** 400 +  
**Narrative:** QWIKNET is a project management package for network planning, scheduling and forecasting. It provides instantaneous critical path method (CPM) scheduling, resource and cost assignments, progress reporting, target scheduling and resource budgeting. A variety of window displays, tabular reports, bar charts and logic diagrams enable managers to perform essential time and resource planning, monitoring and analysis. Pop-down menus that prompt for further instructions and an on-line HELP facility guide the new user. A window management system allows the user to look at several different views of project data simultaneously. The user can change the color, size, and arrangement of windows. Capabilities include time and resource planning, actual cost and resource accounting, cost and schedule performance measurement, "what if" analysis and flexible reporting. QWIKNET can interface with PROJECT/2 integrated Project Management System, and it can produce text files of its data to allow transfer of data to other micro software packages.

**Special Configuration Requirements:** 384K memory, monitor (monochrome or color graphics), printer

<b>Contact Data</b>	<b>Pricing</b>
Doug Little	\$800.00
Micro Products Division	PURCHASE
Project Software & Development, Inc.	
14 Story Street	
Cambridge, MA 02138	
<b>Tele.</b> 617-661-1444	P25449

**RMS-II — RESOURCE MANAGEMENT SYSTEM**

**Product Type:** Applications Software  
**Geographic Area Served:** Worldwide  
**Hardware Supported:** IBM PC; CP/M-based Hardware; MS-DOS-based Hardware  
**Operating Systems:** PC DOS, CP/M-80, CP/M-86, MS-DOS  
**Languages:** Not Specified





**Number of Clients/Users:** Not Specified

**Narrative:** RMS-II is a completely integrated resource management system that allows a project manager to define up to 96 separate resource centers (people, departments, machine tools, test centers, etc.) each with a unique capacity in hours, hourly cost, and burden rate. These resources can then be allocated to the activities in PMS-II projects. Reports can be generated showing these allocations on either a project or a resource center basis. RMS-II is designed for use by contractors with their own crews, engineering or manufacturing firms using a matrix type of organization, or in any project situation where conflicts over scarce resources can arise.

**Special Configuration Requirements:** IBM: 128K; CP/M: 64K; two disk drives, 132-column printer

<b>Contact Data</b>	<b>Pricing</b>
Ann Kalitzke	\$995.00
North America MICA, Inc.	
5230 Carroll Canyon Road	
Suite 110	
San Diego, CA 92121	
Tele. 619-458-1327	
Telex 701257 NAMICA UD	P24631

**SAS/OR® SOFTWARE**

**Product Type:** Applications Software

**Geographic Area Served:** Worldwide

**Hardware Supported:** IBM 370, 30XX Series, 43XX Series, PC; DEC VAX; Prime

**Operating Systems:** DOS/VSE, IBM OS, PC DOS, VMS, PRIMOS

**Languages:** PL/I

**Number of Clients/Users:** 700

**Narrative:** SAS/OR Software is a project management tool for SAS® users. The product effectively supports management decisions with procedures for critical path analysis and linear programming. These procedures can be used to schedule and monitor projects; handle general assignment problems; determine minimum cost flow and shortest path through a network; and solve transportation problems. SAS/OR Software can be used for project planning, product mix models, resource allocation, financial planning, and trans-shipment.

**Special Configuration Requirements:** 512KB mainframes, 2 megs minicomputer, TSO, CMS, SSX, ICCP, Base SAS Software

<b>Contact Data</b>	<b>Pricing</b>
Software Sales Department	PRICE UPON
SAS Institute Inc.	REQUEST
Box 8000	
SAS Circle	
Cary, NC 27511-8000	
Tele. 919-467-8000	
Telex 802505 SAS RAL	P24392

**SCHEDULING AND CONTROL**

**Product Type:** Applications Software

**Geographic Area Served:** United States

**Hardware Supported:** IBM PC, PC-XT, PC-AT; MS-DOS-based Hardware

**Operating Systems:** PC DOS, MS-DOS

**Languages:** PASCAL

**Number of Clients/Users:** 60 +

**Narrative:** Scheduling and Control is a complete textbook/software package covering all aspects of scheduling and control for project management. The text covers project layout, organized timetables, Gantt Charts, PERT and CPM and the Critical Path.

**Special Configuration Requirements:** 128K memory

<b>Contact Data</b>	<b>Pricing</b>
Mel Tainiter	\$95.00
Director of Marketing	
Softext Publishing Corp.	
17 E. 45th Street	
3th Floor	
New York, NY 10017	
Tele. 212-986-5985	P27350

**SUNPLAN II**

**Product Type:** Applications Software

**Geographic Area Served:** United States

**Hardware Supported:** IBM 370, 30XX Series, 43XX Series, PC-XT

**Operating Systems:** IBM OS, OS/VS1, OS/VS2, MVS, PC DOS

**Languages:** ASSEMBLER, FORTRAN

**Number of Clients/Users:** 250 +

**Narrative:** SUNPLAN II is a fully integrated Total Project and Cost Management System — "The First Family of Project Management Systems." SUNPLAN II provides total project and cost management capabilities for the smallest of projects to the largest involving tens of thousands of activities/cost accounts, where multiple projects, resource smoothing/leveling, and multiple year time frames may be required. SUNPLAN II consists of the following products: 1) PREMIS — a project planning, networking, scheduling and resource control system that offers time analysis using either the Arrow Diagramming Method (ADM) or Precedence Diagramming Method (PDM) techniques; 2) SUNPLOT — produces Gantt bar charts, time-phased and non time-phased network charts, and X-Y graphics of resource scheduling; 3) PREVU — provides a fully menu-driven data entry, inquiry and reporting facility; 4) PREMIS PC/WORKSTATION — provides the capability to use either the mainframe host or IBM PC/XT for data capture, data validation, job launch, and information retrieval of PREMIS scheduling information; 5) I/SCSC — a single, complete source for compiling, managing, and reporting cost management information, using the government proven Cost Schedule Control System Criteria (C/SCSC); 6) PICOM — a cost, manpower, and quantity tracking and management tool which can be used in either a project or cost engineering/accounting environment. 7) PI-GRAPH — a cost/manpower graphics system which interfaces to PICOM to provide pie charts, X-Y bar charts and WBS/OBS charts on electrostatic and/or pen plotters or graphic CRTs; and 8) FASTFORM — CRT screen generator and data entry validation utility.

**Special Configuration Requirements:** 512K for mainframes, 256K for PCs; any IBM plug-compatibles

<b>Contact Data</b>	<b>Pricing</b>
Kevin Smith	PRICE UPON
Project Management Services	REQUEST
SIS SunData	
Two Glenhardie Corporate Center	
1285 Drummers Lane	
Wayne, PA 19087	
Tele. 215-341-8797	
TWX 510-668-0004	P24925

**SUPERPROJECT™**

**Product Type:** Applications Software

**Geographic Area Served:** Worldwide

**Hardware Supported:** IBM PC, PC-XT, PC-AT; MS-DOS-based Hardware

**Operating Systems:** PC DOS, MS-DOS

**Languages:** Not Specified

**Number of Clients/Users:** Not Specified

**Narrative:** SuperProject is a project management package designed to give business people greater control over tasks, resources, budgets and scheduling, regardless of industry or level of computer expertise. It incorporates the PERT chart, a network that shows how tasks are interrelated; the Gantt chart, which shows tasks on a time-based bar graph; and Critical Path Method, which shows the effect that delays in one task will have on completion of an entire project. SuperProject supports a virtually unlimited number of tasks, subtasks, milestones and resources. It has built-in calendars for the entire project and for individual resources, and it automatically calculates fixed, variable and total costs for each resource and for the entire project.

**Special Configuration Requirements:** 256K memory, two double-sided diskette drives or hard disk

<b>Contact Data</b>	<b>Pricing</b>
Computer Associates International	\$395.00
Micro Products Division	
2195 Fortune Drive	
San Jose, CA 95131	
Tele. 408-942-1727	
TWX 910-338-2003	P26452





**TARGET/PC PROJECT MANAGEMENT SYSTEM FOR INDUSTRY**

**Product Type:** Applications Software  
**Geographic Area Served:** United States  
**Hardware Supported:** IBM PC  
**Operating Systems:** PC DOS, CP/M-86, MS-DOS  
**Languages:** BASIC  
**Number of Clients/Users:** 8  
**Narrative:** TARGET/pc is a complete project management system designed to support planning, budgeting, scheduling, and management control functions on EDP projects involving design and development of mainframe computer-based information systems. Based on Critical Path Method, TARGET/pc can schedule interdependent project activities, allocate real or hypothetical resources to project activities, develop activity starting/ending dates, identify the critical path(s), compute time-slack on non-critical activities, and tabulate resource requirements by type and cost over the life of a project — interactively. New management priorities, unforeseen resource shortages, or projects behind schedule can be replanned and feasible recovery options identified in minutes. Warranty/guarantee: error-free operation is guaranteed for three months from the time of purchase; any code-error is repaired free of charge. Program maintenance terms: first year updates are free; annual subscription for two updates is \$250.00. Training available: in the supplier's office at no cost. Washington DC only. Manual availability: included in price of program; available separately for \$50.00. Distribution media: 2 x 5-1/4 inch diskettes with program code plus one diskette with demonstration and on-line terminals.  
**Special Configuration Requirements:** 64K memory, two 5-1/4 inch disk drives, parallel printer optional if hard copy desired (but not necessary)

**Contact Data** **Pricing**  
 Director of Marketing \$995.00  
 System Research Services PURCHASE  
 1800 Old Meadow Road  
 Suite 1413  
 McLean, VA 22102  
 Tele. 703-827-9587 P15709

**TASK MONITOR**

**Product Type:** Applications Software  
**Geographic Area Served:** United States  
**Hardware Supported:** IBM PC; MS-DOS-based Hardware  
**Operating Systems:** PC DOS, MS-DOS  
**Languages:** Not Specified  
**Number of Clients/Users:** Not Specified  
**Narrative:** Task Monitor is a menu-driven project management program designed to meet the needs of managers in planning and scheduling. With Task Monitor, a manager can prepare and maintain schedules, cost and labor hours. The program performs critical path management and generates a chart similar to a PERT network. The network can be viewed on the screen and can be printed using a regular printer. The user can define several methods of analysis to assess risks and establish priorities. With the cost management feature, information entered about each activity is used to report on progress-to-date and to estimate dollar cost and labor hours at completion. Predefined reports offer detail information on individual activities and on total project status. The print-out of the network clearly identifies the critical path. Gantt charts are also produced.

**Special Configuration Requirements:** 192K RAM, double-sided disk drive  
**Contact Data** **Pricing**  
 Marketing Manager \$395.00  
 Monitor Software  
 960 N. San Antonio Road  
 Suite 210  
 Los Altos, CA 94022  
 Tele. 415-949-1688 P25736

**TASKMANAGER**

**Product Type:** Applications Software  
**Geographic Area Served:** United States  
**Hardware Supported:** IBM PC; Intel 802XX Series, 808X Series; MS-DOS-based Hardware  
**Operating Systems:** PC DOS, MS-DOS

**Languages:** Not Specified  
**Number of Clients/Users:** Not Specified  
**Narrative:** Taskmanager provides a way to organize a person, department or company. It tracks who is supposed to do what and when. It also schedules up to 999 tasks by starting and completion dates, department, person, project, and subproject. The system tracks man-hours and percent complete and aids in finding conflicts and overloads. It produces reports and Gantt charts on the screen or printer.  
**Special Configuration Requirements:** 128K memory, color or mono display  
**Contact Data** **Pricing**  
 Terri Esterheld \$395.00  
 Director of Marketing PURCHASE  
 Quala  
 23026 Frisca Drive  
 Valencia, CA 91355  
 Tele. 805-255-2922 P17389

**TENSOR PROJECT PLAN (P505)**

**Product Type:** Applications Software  
**Geographic Area Served:** United Kingdom  
**Hardware Supported:** CP/M-based Hardware  
**Operating Systems:** CP/M, CP/M-86  
**Languages:** Not Specified  
**Number of Clients/Users:** Not Specified  
**Narrative:** Tensor Project Plan is a project management package that tracks material labour and overhead factors relating to a project. Labour is calculated from employee time sheets along with expenses. Materials are booked manually or from the Tensor Creditors package. This package has been approved by chartered accountants. Warranty: six months. Program maintenance/update charges: £475. Customer training: £300 per week. Price of manual: included in price of program. Distribution media: floppy disk; cartridge tape.  
**Special Configuration Requirements:** 600K, floppy disk, 80 x 24 screen, printer

**Contact Data** **Pricing**  
 Modus Systems Ltd. £600  
 Park Drive  
 Baldock, Hertfordshire SG7 6EW  
 ENGLAND  
 Tele. 0462 894848 P15162

**TIME LINE**

**Product Type:** Applications Software  
**Geographic Area Served:** United States, Canada, United Kingdom, Europe  
**Hardware Supported:** IBM PC, PC-XT, PC-AT, 3270 PC; COMPAQ; MS-DOS-based Hardware  
**Operating Systems:** PC DOS, MS-DOS  
**Languages:** Modula-2  
**Number of Clients/Users:** 15,000  
**Narrative:** Time Line is designed for use in project management. Using Gantt, PERT and Resource Histogram charts the user can enter an unlimited number of tasks, dependencies, resources and cost categories (depends on memory); partially allocate and pool resources; automatically level overscheduled resources; enter fixed, variable and unit costs up to \$99,999,999; summarize and combine multiple projects; print summary, detail and periodic reports for tasks, resources and costs; and directly export to Lotus 1-2-3, Symphony and dBASE III. A 90-day warranty on diskettes is included.

**Special Configuration Requirements:** 256K minimum memory, two disk drives  
**Contact Data** **Pricing**  
 Sales Department \$495.00  
 Breakthrough Software Corporation PURCHASE  
 505 San Marin Drive  
 Novato, CA 94947  
 Tele. 415-898-1919  
 Telex 323909 (BREAK THRU) P27816





**TRAC LINE MAPS — MANAGEMENT AND PLANNING SOFTWARE****Product Type:** Applications Software**Geographic Area Served:** United States, Canada, United Kingdom**Hardware Supported:** AT&T 3B Series, 6300/7300; IBM PC-XT, PC-AT; Altos; Fortune; TeleVideo; Corona; KAYPRO; Radio Shack; Plexus; MS-DOS-based Hardware; UNIX-based Hardware**Operating Systems:** PC DOS, MS-DOS, XENIX, UNIX**Languages:** COBOL**Number of Clients/Users:** Not Specified**Narrative:** TRAC LINE MAPS is project management software that helps managers plan, organize, direct and control resources. It helps managers use PERT, Critical Path, Crashing and Gantt charts. It allows managers to: 1) Compare actual achievements to planned milestones to see problems; 2) Allocate resources in time; 3) See costs for time, resources and money for alternate plans; 4) Have unlimited tasks, resources, activities or cost categories; 5) Simplify and insure accurate input, eliminating repetition; 6) Track progress in as much detail and as many elements as needed; 7) Change Gantt charts, PERT networks and other graphics without rebuilding master charts; and 8) Vary data elements. TRAC LINE MAPS runs on any operating system supporting ANSI 74 COBOL and most proprietary operating systems. A 90-day replacement guarantee is included.**Special Configuration Requirements:** 256K memory, dual floppy disk drives (hard disk recommended)**Contact Data**

Herb Feinstein

Vice President of Marketing and Sales

TRAC LINE Software, Inc.

51 Alpha Plaza

Hicksville, NY 11801

**Tele.** 516-935-7500 or

800-TRACLIN

**Pricing**

\$495.00/

Single User

\$695.00/

Multi-User

**P27065****TRAVELING PROJECT MANAGER****Product Type:** Applications Software**Geographic Area Served:** United States**Hardware Supported:** IBM PC, PC-XT, PC-AT; Radio Shack Model 2000, 1200 HD; AT&T 6300/7300; ITT XTRA; Olivetti; NEC PC8000; Sharp; MS-DOS-based Hardware**Operating Systems:** PC DOS, MS-DOS**Languages:** Not Specified**Number of Clients/Users:** New Product**Narrative:** The Traveling Project Manager provides a flexible and easy-to-use method of tracking the time and money spent on one or more projects. Users can compare estimated and actual expenditures and check to see how closely they are keeping to their schedules. They may review their progress through summaries and bar graphs on their computer's screen or through a variety of printed reports. All of these programs use a proprietary windowing technique which makes them easily adaptable to any size screen.**Contact Data**

Neil Smith

Traveling Software Inc.

11050 Fifth Avenue, N.E.

Seattle, WA 98125

**Tele.** 206-367-8090**Pricing**

\$99.95

**P27040****U-SCHEDULE****Product Type:** Applications Software, Turnkey System**Geographic Area Served:** United States**Hardware Supported:** IBM PC, PC-XT, PC-AT; MS-DOS-based Hardware**Operating Systems:** PC DOS, MS-DOS**Languages:** Not Specified**Number of Clients/Users:** 7**Narrative:** U-SCHEDULE features project management, resource reporting and cost control, and it allows scheduling by CPM/PERT for an unlimited number of projects with as many as 500 activities each. The database maintains the balance between operational and financial control. Schedule and cost control reports are generated. Network simulation capability provides cost, schedule and what-if analysis. Financial control is achieved by reports for projects cost, cash flow analysis and cash commitment. Operational

control is achieved by day-to-day scheduling and resource reporting. Interactive display of schedules and reports is also provided, as well as creation of independent simulation models out of the master file.

**Special Configuration Requirements:** 256K memory, graphics board, two disk drives**Contact Data**

Carla R. Khan

President

UserCom Systems, Inc.

2200 E. Devon Avenue

Des Plaines, IL 60018

**Tele.** 312-699-1234**Pricing**

\$285.00

LEASE

**P26390****VISISCHEDULE®****Product Type:** Applications Software**Geographic Area Served:** Worldwide**Hardware Supported:** IBM PC, PC-XT; Apple II Series**Operating Systems:** PC DOS, Apple DOS 3.3**Languages:** BASIC**Number of Clients/Users:** Not Specified**Narrative:** VisiSchedule is a powerful project planner. It instantly shows skill levels, costs and the critical path among project tasks. It allocates costs, specifies earliest and latest start dates, slack times, holidays, prerequisites and deadlines for each task. Move, slip, or change any task, skill level or cost, and instantly see the impact.**Contact Data**

Paladin Software Corporation

3255 Scott Boulevard

Building 7, Suite C

Santa Clara, CA 95054

**Tele.** 408-970-7300**Pricing**

PRICE UPON

REQUEST

**P15504****VUE****Product Type:** Applications Software**Geographic Area Served:** Worldwide**Hardware Supported:** IBM Mainframe, PC-XT, PC-AT; DEC System 10-20, PDP-11, VAX; Honeywell DPS 8, DPS 6; Hewlett-Packard 3000; AT&T 3B Series; Perkin-Elmer 3200 Series; Convergent Technologies; Zilog System 8000; MS-DOS-based Hardware**Operating Systems:** VM, PC DOS, TOPS, RT-11, RSX-11, RSTS, VMS, GCOS 8, MPE, OS/32, CTOS, MS-DOS, XENIX, UNIX**Languages:** FORTRAN**Number of Clients/Users:** 135**Narrative:** VUE is an interactive project management system that provides a convenient tool to plan and manage complex projects. VUE performs critical path analysis for projects with up to 3,000 activities each, and as many as 99 related projects with the multi-project option. The menu-driven user interface allows easy data entry, modification and report selection. Reports include schedules, progress to date, current work to be accomplished, bar charts, cost accounting, resource accounting, network precedence diagrams, activity time analysis, predecessors, and calendar specifications. Options include multi-project, plotter graphics, custom reporting, and time-scaled network diagram.**Contact Data**

John Enyedy

National Sales Manager

National Information Systems, Inc.

20370 Town Center Lane

Suite 130

Cupertino, CA 95014

**Tele.** 408-257-7700**Pricing**

\$895.00—

\$26,000.00

**P09125****WORK PRIORITY SYSTEM (WPS), THE****Product Type:** Applications Software**Geographic Area Served:** United States, Canada, United Kingdom, West Germany, Australia/New Zealand, South Africa**Hardware Supported:** IBM PC, PC-XT; Apple II Series, III; Victor; ACT Sirius**Operating Systems:** PC DOS, MS-DOS**Languages:** BASIC, C Language, PASCAL**Number of Clients/Users:** 243**Narrative:** WPS is a practical decision system for managing tasks and time of individuals and teams. It produces work plans and





**THE BUSINESS PLANNER**PUBLISHER'S NAME: **Duosoft Corporation**MEMORY REQUIRED: **48K**SOURCE LANGUAGE: **PASCAL**OTHER REQUIREMENTS: **Two disk drives**

**DESCRIPTION:** Business Planner provides a simulated model of a business and projects monthly income and expense figures, asset allocations, and sales forecasts to help analyze underlying assumptions in depth. Management decisions can be tested before commitments are made. Business Planner combines projects into alternative models to predict future growth.

**\$395.00****CRITICAL PATH METHOD & JOB SCHEDULING PROGRAM**PUBLISHER'S NAME: **Elite Software Development, Inc.**MEMORY REQUIRED: **56K**SOURCE LANGUAGE: **CB80**OTHER REQUIREMENTS: **Two 150K disk drives**OPERATING SYSTEMS: **CP/M-86**

**DESCRIPTION:** Critical Path Method & Job Scheduling Program is a job scheduling tool that will allow evaluation of the relative importance of the various tasks associated with completion in a given project. The PERT approach requires three estimates for completing an activity, while the CPM approach requires only one time estimate. Both methods will find a critical path in the network describing the activities required for completion of the project. This critical path is the longest path that may be taken from the beginning activity to the final activity. Activities that are on this critical path are said to be critical. An activity is critical if a delay in its completion will cause a delay in the completion of the entire project. Other activities have slack time, meaning that the activity may be completed beyond its original planned completion date and still not hold up the entire project. A complete schedule concerning all activities is supplied and, as shown in the accompanying output, each activity is given scheduling dates. They are as follows:

Start is the earliest date that the activity may be undertaken.

Finish is the earliest possible completion date for a given activity.

Late start is the latest date that the activity may be undertaken in order to finish on time.

Late finish is the latest date that the activity may be completed without holding up the entire project. This date will set the deadline for each activity of the project.

If an activity is critical, the late finish date will be the same as the early finish date indicating that there is no slack time for the activity.

All critical activities should be given priority and be monitored closely. The program will also give the expected completion date of the project for the activities defined along with an activity schedule. The expected duration or critical path length is compared to the desired completion date so that a probability is given on the chances of completing the project on time.

The program will allow the user to define a project network with up to 100 activities. All data may be stored on the disk in a format selected by the user. Using the PERT method allows the probability that the completed project will be printed and displayed to the user with the option of entering costs for each

activity. If entered, an estimated total project cost is then printed.

**PRICE: \$249.00****TITLE: CRITICAL PATH SCHEDULING**PUBLISHER'S NAME: **Rambow Enterprises**MEMORY REQUIRED: **256K**SOURCE LANGUAGE: **Compiled BASIC**OTHER REQUIREMENTS: **Printer 80/220 column**

**DESCRIPTION:** Critical Path Scheduling includes standard early-late starts-finishes, float time, critical path, and bar charts. The program will handle 500 individual activities for a single project. Version 2 will handle 2,500 activities, cash flow tracking, manpower leveling, network crashing, and network generation on a plotter.

Source code is not available and disks are not copy protected. Program updates are available for \$10.00 and many examples are given with the program disk. Customer support is included after sale.

**PRICE: \$ 500.00 version 1****\$1500.00 version 2****TITLE: DATA SCHEDULER**PUBLISHER'S NAME: **Data\*Easy Software**MEMORY REQUIRED: **64K**

**DESCRIPTION:** This program allows the user to display projects that will show up to seven different jobs one at a time. Displayed on a day-by-day basis, it will show the length of each job to be done, firm or proposed job, and who's responsible for the completion of each job. Data Scheduler will display ten weeks of data at one time. The listed projects can cover up to a two-year period.

**PRICE: \$35.00****TITLE: DATA\*EASY/PROJECT MANAGER**PUBLISHER'S NAME: **Data\*Easy Software**MEMORY REQUIRED: **64K**SOURCE LANGUAGE: **BASIC, Assembler**OPERATING SYSTEMS: **MS DOS**

**DESCRIPTION:** Data\*Easy/Project Manager will display projects visually showing up to seven different tasks (subprojects) at one time. Data is displayed on a day-by-day basis and will show the length of each task, whether it is firm or proposed, and who has the responsibility. Projects can be as long as two years and up to ten weeks of information can be seen on the screen at one time. Progress charts may be set up and the source code is supplied by the user.

**PRICE: \$35.00****TITLE: DEMI-PLAN PROJECT MANAGEMENT SYSTEM**PUBLISHER'S NAME: **Demi-Software**





MEMORY REQUIRED: 128K  
OTHER REQUIREMENTS: Printer

**DESCRIPTION:** Demi-Plan Project Management System is a project scheduling/management program that allows the user to define and maintain a complete file of project jobs and resources. The information from the file is used to print different forms of Gantt charts, resource histograms, and task/resource cross-reference.

This program will determine the critical path of a project. The operator can use what-if data that will show resource and data changes.

PRICE: \$74.00

#### TITLE: FORWORK

PUBLISHER'S NAME: Percs Software

MEMORY REQUIRED: 128K

OS: C

OTHER REQUIREMENTS: Two double-sided disk drives

**DESCRIPTION:** ForWork is a project and resource management system that provides a manager or project team member with an advanced software system to schedule and monitor the progress of multiple projects using multiple interrelated resources on a day-to-day basis. An immediate analysis of the effect of a schedule change is provided.

Resource usage leveling permits a manager to schedule a project to fit an even level of resource commitment without under or over utilization. The ForWork calendar is capable of scheduling projects in one minute increments at any time from 801 to 2099. This permits a manager to use a definition of many of fiscal quarter and to change the definition of these times without making some entries.

Once a project has been scheduled and resources are planned, a manager may change the clock to limit or part analysis within any period of time. This allows the scheduling of projects of an unknown length with an incomplete view of the total scope of the project. Reports and graphs state information as appropriate to various management levels without the need to manually perform summarization. This includes the information content of reports needed by a broad spectrum of management levels. The ForWork system is divided into the following six primary functional areas:

Resource dictionary maintenance - The dictionary file contains various sections that list the human and material resources available, the corporate management structure, the availability of various resources, and the ownership of those resources.

Project schedule modeling - Projects are composed in a series of steps called tasks. Modeling allows creation of templates for projects of a repetitive nature prior to the actual scheduling and correspondent commitment of resources. The commitment of resources is global in scope among all scheduled projects but individual tasks within a project may not be dependent on tasks outside of the same project. Interproject dependencies may be simulated by the creation of dummy tasks. The system computes the projects critical path as well as split type project completion times at various confidence levels.

Progress and completion reporting - Once a project is scheduled, in progress entries may be made as often as

desired. A reasonable schedule of once a day or once a week will reflect the true condition of projects currently underway. In progress and completion entries play an important function within ForWork. The scheduling algorithms in use are based on using the most current information to create new schedules based on all current information available. Thus, it is possible that another project that was delayed because of a lack of a resource can be accelerated if that resource becomes available.

- Report generation - ForWork generates many reports that reflect the current status of project completion as well as resource utilization. These reports are available on demand and are based on the most current information available. Project performance reports are available that relate the projected completion of project tasks to their actual reported completion. A limited amount of historical cost data is also captured although ForWork is not designed to maintain total job cost for input to any other accounting system.
- Graphics - ForWork generates Gantt charts and trend graphs for display using either the IBM color graphics adaptor or the IBM PC graphics printer. A limited form of charts may be graphed on the screen and on an 80 column printer using the standard ASCII character set.
- Communication - The ForWork system contains a function to translate data files into standard printable ASCII sequential files suitable for transmission over telephone or dedicated lines to other personal or mainframe computers.

PRICE: \$595.00 additional copies at 10% of first price of documentation

#### TITLE: GANTT-IT

PUBLISHER'S NAME: A +

MEMORY REQUIRED: 192K

OTHER REQUIREMENTS: Two disk drives or a hard disk

OPERATING SYSTEMS: MS DOS

**DESCRIPTION:** Gantt-It provides a pre-defined record that contains most of the fields the user may need. The user can print task reports in any sequence. Person, department, or end date are a few examples. The user can select assigned tasks to review resource loading. The program will report last month's completed tasks by department to the client managers to communicate progress.

When cost or activity is updated in the task record, a transaction file is posted with a record of the transaction. This transaction is used for cost allocation. Reports may be prepared showing cost year-to-date, cost by project phase, cost by project-to-date, hours by person, hours by department (year-to-date, for a month, or any time period).

Gantt charts will selectively fill up the unused right side of task reports if the user requests. Gantt a period of a few months to over two years. Use Sideways to print charts longer than the print width of the printer.

Save and recall frequently repeated sets of keystrokes for repeating common system activities such as printing a weekly report. The user can create an output file that can be read by spreadsheet or word processing systems. The user can customize applications using the pre-requisite under-control facility. Other features include the following:

- number of fields and record length limited only by available memory and disk storage





character maximum field length 65  
 numeric maximum field length ten  
 report maximum width 999  
 approximately 640 tasks with 256K memory and one double-sided diskette

UC \$70.00

#### LINEAR PROGRAMMING

PUBLISHER'S NAME: Institute of Industrial Engineers  
 SOURCE LANGUAGE: BASIC

DESCRIPTION: To solve linear programming problems, the Linear Programming package utilizes the Simplex method. The program permits interactive input of the constraints and the objective function. This approach is effective in solving small linear programming problems.

PRICE: Contact Dealer

#### MILESTONE

PUBLISHER'S NAME: Digital Marketing Corporation  
 MEMORY REQUIRED: 56K  
 OTHER REQUIREMENTS: Two disk drives  
 OPERATING SYSTEMS: CP/M-86

DESCRIPTION: Milestone is designed to expand the application of critical path analysis. It will combine the fundamentals of critical path analysis into a package that runs on a desktop computer. Instead of replacing PERT/CPM (program evaluation and review technique/critical path method) programs, Milestone is designed to complement them. It is designed to track small projects for the user who doesn't require complex techniques. It can be useful for two kinds of managers: those not currently using planning tools and those disenchanted with their present PERT/CPM packages.

Milestone will answer fundamental questions such as when a project will be completed, how much it will cost, whether it is ahead of or behind schedule, and how delaying an activity will affect project completion. The program will prepare detailed cost estimates based upon a summation of each activity's individual print and manpower expenses.

Milestone will help the user examine the trade-offs between manpower, dollars, and time and keeps track of a project's progress by periodically updating the schedule to reflect changes in the plan and completed activities. Other features include the following:

• interactive allowing the user to ask what-if questions about the schedule any time a new activity is added or an existing one is changed  
 • allows the user to view a project through a movable screen window  
 • periodically displays manpower and cost summaries at the bottom of the screen

• allows the user to enter a project of 100 or more activities without drawing an arrow diagram or creating dummy nodes  
 • allows the user to go through a menu hierarchy selecting options or changing data  
 • keeps all project data in memory to eliminate disk input/output  
 • uses integer arithmetic for all computations  
 • helps to determine which activities are time critical

- measures time units in hours, days, weeks, months, quarters, or federal fiscal quarters

PRICE: \$295.00

#### TITLE: MILESTONE

PUBLISHER'S NAME: Organic Software, Inc.

MEMORY REQUIRED: 56K

SOURCE LANGUAGE: PASCAL

OTHER REQUIREMENTS: 80 column printer, 24 X 80 display with cursor positioning and a home and clear function

OPERATING SYSTEMS: CP/M-86, UCSD p-System

DESCRIPTION: Milestone is designed to expand the application of critical path analysis into areas where it was not considered before.

Milestone internally treats a project as a series of activities. Each activity has a name, capital cost, duration mix of manpower, and an associated list of other activities that must be completed first. This list of prerequisites provides the thread that Milestone uses to link all projects together into an overall project schedule. Every time a new activity is added, or an existing one is changed, the entire schedule is recomputed and redisplayed on the screen. Subfiles may be created to break down each activity in a master project.

Some of the things that can be accomplished with the Milestone program include:

- discover which activities have slack time (can be delayed without delaying the entire project)
- prepare a detailed cost estimate based on a summation of each activity's individual equipment and manpower expenses
- change an activity and see the results on the overall project schedule
- investigate the trade-offs between manpower, dollars, and time
- communicate a plan to subordinates

Milestone can also be used as a planning calendar to:

- keep track of special meetings, conferences, business trips, and vacations
- plan organization's projected workload for the coming year
- allocate the rental or other use of equipment and resources

PRICE: Contact Dealer

#### TITLE: MPCS PROJECT MANAGER

PUBLISHER'S NAME: S & T Associates

DESCRIPTION: This management program was designed to project management, control, and schedule with company, project phase, and task control levels. MPCS Project Manager includes the following features:

- administration
- maintenance of data
- time accounting
- task planning
- management reporting

PRICE: Contact Dealer

#### TITLE: P/MS

PUBLISHER'S NAME: System Research Services





**THEORY REQUIRED:** 128K  
**SOURCE LANGUAGE:** MBASIC  
**OTHER REQUIREMENTS:** Two disk drives, video color monitor, graphics printer, hard-disk are supported)

**DESCRIPTION:** p/MS is a project management support system that will assist information system developers budget, plan, monitor, analyze, report, and control software development projects. It is based on the critical path method and will do the following:

- schedule and allocate real or hypothetical resources
  - develop starting/ending dates for interdependent project activities
  - identify the critical path(s)
  - compute time slack on non-critical activities
  - calculate resource requirements by type and cost over the life of a project
  - The user can re-plan new management priorities, spot unforeseen resource shortages, and find existing projects in trouble.
- The program is menu-driven, color graphics-oriented, and utilizes on-line help screens to aid the first time user.

**PRICE:** \$995.00

**TITLE:** PERTMASTER  
**PUBLISHER'S NAME:** AHA, Inc.  
**MEMORY REQUIRED:** 64K  
**SOURCE LANGUAGE:** CBASIC  
**OTHER REQUIREMENTS:** 132 column printer  
**OPERATING SYSTEMS:** CP/M-86

**DESCRIPTION:** Features of Pertmaster include the following:

- calculation
- on-screen reports
- bar charts
- resource histograms
- precedence or activity-on-arrow

**PRICE:** \$695.00  
 \$250.00 for demo

**TITLE:** PERTMASTER  
**PUBLISHER'S NAME:** Westminster Software  
**MEMORY REQUIRED:** 64K for CP/M-86, 128K for IBM PC  
**SOURCE LANGUAGE:** MBASIC  
**OPERATING SYSTEMS:** CP/M-86

**DESCRIPTION:** Pertmaster is a personal computer application that allows users to manage multi-activity projects using the Project Evaluation and Review Technique (PERT) or Critical Path Analysis method (CPA). Pertmaster has a maximum project network size of 1500 activities and accepts up to 10 different resources per activity. It will analyze and update a network and is compatible with most CP/M, MP/M, PC-DOS, MS-DOS, 64K byte operating systems with rigid or floppy dual disk drives, and printers with a line capacity of at least 132 characters. The user can produce bar charts and histograms describing projects on standard character printers.

**PRICE:** \$695.00

**TITLE:** PLANFLOW  
**PUBLISHER'S NAME:** Project Control Systems  
**MEMORY REQUIRED:** 64K  
**OTHER REQUIREMENTS:** Two disk drives, 132 column printer

**DESCRIPTION:** This program is designed to be used for large capital projects by contractors, estimators, and engineers. PlanFlow gives the user on-screen spreadsheets that allow preparation of distribution models. The program will raph costs and manpower requirements on any designated project.

The user can define distribution curve shapes and then store them using historical data or proposed pricing schedules. All items are merged as updates are input. PlanFlow gives the user the capability to print distribution graphs for any one item or for the total project.

**PRICE:** \$495.00

**TITLE:** PLANTRAC  
**PUBLISHER'S NAME:** Computerline, Ltd.

**DESCRIPTION:** This program will guide the user through network creation and amendment, time resource, cost analysis, scheduling, updating, and reporting. Additionally, the user is allowed up to 12,000 activities. The report formats can be user-defined.

**PRICE:** Contact Dealer

**TITLE:** PMS II  
**PUBLISHER'S NAME:** North America MICA, Inc.  
**MEMORY REQUIRED:** 64K  
**SOURCE LANGUAGE:** CBASIC, CBASIC 86  
**OTHER REQUIREMENTS:** Two disk drives, 132 column printer  
**OPERATING SYSTEMS:** CP/M-86

**DESCRIPTION:** PMS II is a full scale critical path project management system that will calculate early and late start and finish, float and critical path(s) for networks of up to 1,250 activities or 2,500 activities in a 128K 16-bit machine. Included are super- and subnetworking features and project size is unlimited. The system will print activity reports and Gantt charts with sort and select capabilities, the activity diagram, funding schedule and graph, and three part earned value analysis reports. The system operates on 3, 4, 5, 6, or 7 workdays per week on a percent complete, actual start/finish, or days remaining basis and will accomodate up to 100 user-defined holidays. PMS II will track budget and actual material, labor and burden dollars and will interface to any job cost system or dBASE II. It satisfies all Corps of Engineers ER 1-1-11 and baseline DOD 7000.2 specifications.

RMS II is a resource management subsystem designed for use with PMS II and allws for the definition f up to 96 resource centers. Each includes a capacity in hours per day and a wage and burden rate. Any portion of any resource can be allocated to any activity in any project defined under PMS II Reports can be generated for one center or any combination of centers showing line item detail allocations as well as a bar graph that shows allocations as a percent of capacity (0% to 200%) over time. Allocations are also displayed on PMS II activity reports. RMS II is designed for engineering, R&D, prototyping, and software





development environments as well as any project oriented company using a matrix management organization.

PRICE: \$1295.00

### PMS-II

PUBLISHER'S NAME: AHA, Inc.

DESCRIPTION: PMS-II - Project Management System is designed for managing any complex project. This program will do the following:

R&D construction  
business planning  
100+ events on critical path  
bar charts

PRICE: Contact Dealer

### PRO-JECT 6

PUBLISHER'S NAME: Softcorp, Inc.

MEMORY REQUIRED: 128K

OTHER REQUIREMENTS: Printer recommended

DESCRIPTION: Pro-Ject 6 is a project management program that can help manage, schedule, and minimize cost on a job. The features of Pro-Ject 6 include the following:

critical path automatically calculated  
schedule updated in real-time  
what if analysis  
color or monochrome display  
completion time automatically calculated  
projected completion date displayed after each change  
bar chart or task details can be displayed  
resources can be specified by task and resource  
multiple work calendars supported  
holidays and non-work days can be defined  
progress can be reported with task completions  
multiple resource types supported  
user definable reports  
critical tasks highlighted

PRICE: 149.00

### PROJECT MANAGEMENT SYSTEMS I

PUBLISHER'S NAME: Softpoint

DESCRIPTION: This system will produce time, manpower, and cost reports. The data base will maintain projects and projects that can be updated. Some other features of Project Management Systems I include the following:

what if analysis  
Gantt charts  
user driven  
does not require networks to be diagrammed

PRICE: Contact Dealer

### PROJECT SCHEDULER

PUBLISHER'S NAME: Scitor Corporation

DESCRIPTION: Project Scheduler is a project management program that is designed to help management meet deadlines and beat cost targets through project forecasting, scheduling, control, and tracking of project status. The menu prompts permit data entry for modification or update to large, complex project plans. The program allows what if analysis. Features of Project Scheduler include the following:

- critical path is calculated
- a Gantt chart is displayed after each add, delete, or change
- interactive what if analysis
- display data/plots using the monochromatic or color screen
- schedules projects by days, weeks, months, or day displayed by week
- labor and other cost data can be input to VisiCalc and SuperCalc spreadsheet packages
- allocate tasks by start and duration, early start, and late start
- creates standard company labor grades, other direct costs, holidays, 24 labor grades, 24 other direct costs, and 30 holidays (multi-year)
- creates detailed and summary reports including project schedule, labor and cost by time period, labor and cost by individual job
- ability to complete jobs for performance tracking
- milestone annotation to identify special events in the project

PRICE: Contact Dealer

### QUEUEING MODELS

PUBLISHER'S NAME: Institute of Industrial Engineers

SOURCE LANGUAGE: BASIC

DESCRIPTION: The Queueing Models system enables the industrial engineer to calculate the expected number of individuals waiting and the utilization of servers for various waiting line models such as the finite queues, multiple server, or limited source models. Program features include interactive data entry and editing, error checking and recovery, and printed output reports.

PRICE: Contact Dealer

### RESOURCE MANAGEMENT SYSTEM

PUBLISHER'S NAME: AHA, Inc.

MEMORY REQUIRED: 64K

SOURCE LANGUAGE: CBASIC

OTHER REQUIREMENTS: 132 column printer

OPERATING SYSTEMS: CP/M-86

DESCRIPTION: Resource Management System links with PMS-II for allocating resources to events scheduled by PMS-II. The user can define up to 96 resources including personnel, equipment, and up to 32,000 allocations across all or selected projects to automatically schedule resources within activities. The program will calculate direct and burdened costs for budgeting purposes. Tabular and graphic reports assist in doing capacity planning and load leveling.

PRICE: \$995.00

\$ 50.00 for demo

### SIMPLEX PC

PUBLISHER'S NAME: Dynamic Micoprocessor Associates, Inc.





**MEMORY REQUIRED:** 64K  
**SOURCE LANGUAGE:** Compiled BASIC

**DESCRIPTION:** Simplex PC is designed for many cost control, profit maximization, and other optimization situations. It will solve linear programming problems with up to a 50 x 50 matrix and provides the option to display each iteration of the iteration.

**PRICE:** \$49.95

**TITLE:** SIMPLEX PC II  
**PUBLISHER'S NAME:** Dynamic Microprocessor Associates, Inc.

**MEMORY REQUIRED:** 128K, 192K  
**SOURCE LANGUAGE:** Compiled BASIC  
**OTHER REQUIREMENTS:** 128K for VisiCalc, 192K for Lotus 1-2-3

**DESCRIPTION:** Simplex PC II is an extension of Simplex PC with expanded capabilities. It will allow the user to solve linear programming problems in up to a 100 x 100 matrix. It uses a spreadsheet program (VisiCalc, Lotus 1-2-3) to set up problems with complete names for variables) and after execution, to view the problem solution (final tableau). The ability to pose hypothetical questions (i.e., add/change constraint variables, change coefficients of variables) is provided through the problem listing available via the spreadsheet edit, copy, move, and delete commands. The standard data storage format provides a method to input data from any source.

**PRICE:** \$100.00

**TITLE:** TARGET/PC  
**PUBLISHER'S NAME:** System Research Services

**MEMORY REQUIRED:** 128K  
**SOURCE LANGUAGE:** MBASIC  
**OTHER REQUIREMENTS:** Two disk drives (SS/DS), (color monitor, graphics printer, hard disk supported)

**DESCRIPTION:** Target/PC is a project management support system that will assist project managers to budget, plan, monitor, analyze, report, and control any type of project. It is based on the critical path method and will do the following:  
 - schedule and allocate real or hypothetical resources  
 - develop starting/ending dates for independent project activities  
 - identify the critical path(s)  
 - compute time slack on non-critical activities  
 - calculate resource requirements by type and cost over the life of project  
 - New management priorities, unforeseen resource shortages, delaying projects in trouble can be replanned. The program menu-driven, color graphics oriented, and utilizes on-line help screens to aid the first time user.

**PRICE:** \$450.00

**TITLE:** TASK MANAGER  
**PUBLISHER'S NAME:** Quala

**MEMORY REQUIRED:** 128K

**DESCRIPTION:** Task Manager will help the user to spot conflicts and overloads, and balance schedules. The program will handle up to 999 separate tasks. Enter the projects needed to oversee, organize, and keep moving. The program will keep track of 11 pieces of data for each task. The system accepts the following task information:

- description of task
- task number
- beginning date of task
- priority of task
- completion date of task
- person responsible
- department assigned
- subproject identifier
- man-hours
- project-identifier
- percent complete

The user can add, revise, update, and manipulate this data. The three different reports on the screen or printer are Gantt charts, Task listings, and Man-hours summary reports.

Gantt charts allow the user to get a visual assessment of where each project is in terms of beginning and completion dates. The user can use this chart to spot conflicts, problem areas, bottlenecks, and open time.

Task listings will give the information on a given task organized by either department, individual, project, completion date, etc.. Use this list to review progress and workloads.

Man-hours summary reports will summarize the man-hours and average percent complete for all tasks meeting given selection criteria, i.e., total man-hours and average percent completed committed by a given person or department against a given project in a certain quarter. Use this report to assess time investments, profitability, and performance.

**PRICE:** \$250.00

**TITLE:** TASKMASTER  
**PUBLISHER'S NAME:** Quala  
**MEMORY REQUIRED:** 128K  
**OTHER REQUIREMENTS:** 80 column printer

**DESCRIPTION:** Taskmaster is designed to organize a department, company, or other user activities. It assists in tracking who should be doing what and when. Up to 999 tasks can be scheduled. Schedules include project and subproject, department, person, completion dates, and starting dates.

- Taskmaster will track man hours and percentage of completions. The user will be able to print or view reports and Gantt charts.

**PRICE:** \$139.95

**TITLE:** THE HARVARD PROJECT MANAGER  
**PUBLISHER'S NAME:** Harvard Software, Inc.  
**MEMORY REQUIRED:** 128K  
**OTHER REQUIREMENTS:** Two double-sided disk drives or one double-sided disk and a hard disk  
**OPERATING SYSTEMS:** MS DOS

**DESCRIPTION:** The Harvard Project Manager will plan and manage any sized project. A user will be informed if a project is





regined and is given many evaluated alternate courses of action to get the project back on track. The program is a presentation-communications tool that provides project status reports to superiors, peers, customers, prospects, and vendors. A communications vehicle is included that will make others aware of project delay or cost overruns and also for any changes that are made after the project is underway.

The critical path method and the program evaluation and review technique (PERT) are included. The Harvard Project Manager will draw pictures to help the user do a particular job. The system will constantly update the user on the project "roadmap" on the display screen. The program uses the computer's character set to construct all graphical elements that are necessary for project management. It will also display the project as a Gantt chart that shows when each task begins and ends. The user can specify task durations in units that range from minutes to years of working or elapsed time. The user can also specify the time for completing each task in the project. As the definition of a project is refined the program will continually re-calculate and display the total project cost and duration. The program highlights the project critical path at all times. If certain tasks in any project are said to be critical and are delayed, the entire project will be delayed.

The Harvard Project Manager works with real dates so the user can specify the length of the work day, the work week, holidays, and vacation shutdowns. Any non-critical task has a buffer extra time during which the task may be completed and will not delay the project. The program permits the user to schedule the start of all tasks. The user may also similarly constrain any non-critical milestone, to occur before or after specified points, in time to meet external requirements such as the availability of resources.

The program offers a mechanism for simulating various possible occurrences and decisions and analyzing potential outcomes. Once a project is underway, the user may give the program the actual task start and completion dates and times. The user may also specify percentages of completion for those incomplete tasks for which such data is useful. The system displays this information in the schedule window projecting the completion of tasks that have begun but are not yet finished. Actual costs for completed tasks may also be specified.

The Harvard Project Manager treats any task as a subproject. Many graphic techniques are employed in the program. One feature is the division of the display screen into several graphical windows as needed. This permits the user to make structural modifications to the project roadmap or to change task durations and simultaneously monitor the impact of changes on the project schedule.

Zooming is supported allowing the user to pan the display display both horizontally and vertically to examine a project roadmap or schedule that is much larger than that which fits on the screen.

High-resolution hard copy output of the graphical images using dot-matrix printers is included. Optional sideways printing will produce large roadmaps without having to tape sheets of paper together. Various tabular printed reports are available. User's can request the program to generate a "things to do list". For example, a project status report that includes all tasks that are the responsibility of "Johnson" and are scheduled for completion next week.

**TITLE: THE WORK MANAGEMENT SYSTEM**

**PUBLISHER'S NAME: LWWF Group**

**MEMORY REQUIRED: 128K**

**OTHER REQUIREMENTS: Two megabyte hard disk, dBASE II**

**DESCRIPTION:** Designed primarily to assist the municipality field operations manager in scheduling, productivity, and evaluations, this program will allow the user to justify any allocated resources and capital expenditures, and to develop work plans. The program will provide the user with data in work backlog and work performed in the following areas:

- traffic control
- airports
- streets
- utilities
- sanitation
- parks
- buildings

The Work Management System can be adapted for use in grounds maintenance, plant, facilities maintenance, and construction work.

**PRICE: \$395.00**

**TITLE: WORK MANAGEMENT**

**PUBLISHER'S NAME: Busyprow, Inc.**

**DESCRIPTION:** This is a work management system which allows the user to keep track of time spent with clients and projects, by both employee and function. Work Management tracks direct expenses by type and in-house vs. outside charges. To allow the user extension and customization, dBASE II source code and program generators are included.

**PRICE: \$99.00**



APPENDIX (G)





CONSTRUCTION CLAIMS

AND

DCRS

**FOLEY AND RAY, INC.**

**Consultants**

2670 Ravenoaks Place  
Marietta, Georgia 30062  
(404) 587-2091



## .FOLEY AND RAY, INC.

FOLEY AND RAY, INC. is a construction industry consultant firm involved in the construction claims field.

FOLEY AND RAY develops technical and factual data for inclusion in the claim or claim of defense package and advises the clients counsel on the technical aspects of the dispute. This may include the analysis of construction methods, project manning and equipment utilization as they affect the dispute, preparation of models, graphics and/or other displays necessary for a clear presentation of the case, and preparation and analysis of the cost data used in a determination of the damages.

The FOLEY AND RAY personnel have a strong background in construction claims having experienced the claims process both as a part of various contractors' management teams and as consultants. The consultants familiarity with construction comes as a result of having managed construction projects and having had the responsibility for the administration of these projects which included correspondence, documentation, cost engineering scheduling, and claims preparation and negotiation.

FOLEY AND RAY has expanded its construction claims services to include a DOCUMENT CONTROL AND RETRIEVAL SYSTEM (DCRS). DCRS is an automated system for handling the large volume of documents most often utilized in a large construction claim.

The use of DCRS by the FOLEY AND RAY claim consultants, during the preparation stage, allows the investigation of many alternate claim possibilities by eliminating the need to review the whole file when follow-up is required on the new alternates.

The DCRS can be utilized in various ways; it can provide listings of documents relative to the various issues; it can provide listings of documents which are related to the various issues by reference; and, it can provide an auditable paper trail from "as built" schedules directly to the supporting diaries and reports.

Depositions can also be included in the DCRS allowing the FOLEY AND RAY claims consultants and attorneys to quickly access those portions of a deposition which bear on the various issues.

Because of the automated system utilized in DCRS, access to the desired information is rapid, often in minutes, and therefore it can be used effectively during arbitration and litigation to assist the attorneys in both presentation and rebuttal.

Use of the DCRS allows the FOLEY AND RAY consultant to expand his depth of research, thus allowing for a more thorough analysis based upon the factual information available.



## DOCUMENT CONTROL AND RETRIEVAL SYSTEM (DCRS)

For the purpose of demonstration, a model of a typical project has been developed. This model project includes several potential construction claims for the purpose of analysis.

The project is an addition to a city maintenance facility. The documents available from the project consist of the correspondence to and from the city and the diaries of the contractors' superintendent. The documents consist of 83 letters and 98 diary sheets covering a five (5) month period "from award" to "final acceptance". The project documents all relate to one another, and when read in their entirety, reflect a coherent job narrative typical of that found on a job of this nature.

The original planned project completion date was impacted by two (2) delays, one caused by the excavation subcontractor and the second caused by the cities' failure to deliver equipment per the contract. The project was put on the DCRS and the following are a few examples of the types of reports which can be generated. The DCRS is very flexible and will generate any type of report as the particular claim dictates.





It was first decided to identify the documents pertinent to the two (2) delays. Reports 01 and 02 were generated to locate any references directly to the excavation delay and Reports 03 and 04 were generated to locate any references to the owner furnished equipment delay. Reports 01 and 03 are the results of the search of the correspondence and Reports 02 and 04 are the results of the search of the superintendents' diaries.



DCRS NO: 101  
PROJECT: CENTRAL MAINTENANCE ADDITION ROSWELL, GEORGIA  
REPORT NO: 01  
FILE NO: CORRESPONDENCE

REPORT TITLE: LIST OF ALL DOCUMENTS  
BY DOCUMENT CONTROL NUMBER AND DATE RELATIVE TO  
THE DELAY IN EXCAVATION OPERATIONS ON THE PROJECT

CONTROL NUMBER	DATE	DOCUMENT ABSTRACT
063	040183	ABC WILL BEGIN OPNS 04/04/83. PHILLIPS WILL WORK DOUBLE SHIFTS STARTING 04/27/83 TO GET PROJECT ON SCHEDULE.
0103	032283	ABC BEHIND DIRECTED TO BRING PROJECT UP TO SCHEDULE



DCRS NO. 101  
PROJECT CENTRAL MAINTENANCE ADDITION ROSWELL, GEORGIA  
REPORT NO: 02  
FILE NO: DIARIES

REPORT TITLE: LIST OF ALL DOCUMENTS  
BY DOCUMENT CONTROL NUMBER AND DATE RELATIVE TO  
THE DELAY IN EXCAVATION OPERATIONS ON THE PROJECT

CONTROL NUMBER	DATE
0139	031183
0143	031683
0144	031783
0145	031883
0150	032483
0153	032883
0162	040883
0164	031083
0165	041183





DCRS NO. 101  
PROJECT: CENTRAL MAINTENANCE ADDITION ROSWELL, GEORGIA  
REPORT NO. 03  
FILE NO: CORRESPONDENCE

REPORT TITLE: LIST OF ALL DOCUMENTS  
BY DOCUMENT CONTROL NUMBER AND DATE RELATIVE TO  
THE DELAY IN DELIVERY OF OWNER FURNISHED EQUIPMENT

CONTROL NUMBER	DATE	DOCUMENT ABSTRACT
058	031683	NOTICE OF INTENT TO FILE CLAIM C-1
071	042083	INTENT TO FILE CLAIM AS SOON AS DELIVERY DATE OF LIFT IS KNOWN
081	051883	CPM SCHEDULE S-3 SUBMITTAL DELIVERY OF HYDRAULIC LIFT UNIT
085	060483	CLAIM C-1. DELAY DUE TO LATE DELIVERY OF HYDRAULIC LIFT UNIT
0100	031483	
0100A	031483	
0111	041883	HYDRAULIC LIFT AVAILABLE WEEK OF 05/09/83
0112	042983	PROPOSAL FOR DEDUCT ON CN NO. 1 ACCEPTED



PAGE NO 00001

DCRS NO: 101  
PROJECT CENTRAL MAINTENANCE ADDITION ROSWELL, GEORGIA  
REPORT NO: 04  
FILE NO: DIARIES

REPORT TITLE LIST OF ALL DOCUMENTS  
BY DOCUMENT CONTROL NUMBER AND DATE RELATIVE TO  
THE DELAY IN DELIVERY OF OWNER FURNISHED EQUIPMENT

CONTROL NUMBER	DATE
138	031083
160	040583
169	041583
171	041883
194	051383
198	051883



Since the excavation delay was caused by a subcontractor,  
Report 05 was generated to locate any reference to  
subcontractors in the correspondence.





DCRS NO 101  
PROJECT CENTRAL MAINTENANCE ADDITION ROSWELL, GEORGIA  
REPORT NO. 05  
FILE NO. CORRESPONDENCE

REPORT TITLE LIST OF ALL DOCUMENTS  
BY DOCUMENT CONTROL NUMBER AND DATE RELATIVE TO  
SUBCONTRACTOR OPERATIONS ON THE PROJECT

CONTROL NUMBER	DATE	DOCUMENT ABSTRACT
052	030783	PROPOSED CONTRACTORS LIST
063	040183	ABC WILL BEGIN OPNS 04/04/83. PHILLIPS WILL WORK DOUBLE SHIFTS STARTING 04/27/83 TO GET PROJECT ON SCHEDULE.
066	040683	LIFT LATE, SCHEDULE TO BE REVISED TO PLACE FLOOR AFTER ROOF TO KEEP COMMITMENT TO ROOF SUB.
083	052683	INSORMLE CERTIFICATE - E2 ELECTRIC - SUBMITTAL
099	031183	SUBCONTRACTORS APPROVED
0103	032283	ABC BEHIND DIRECTED TO BRING PROJECT UP TO SCHEDULE
0105	033083	
0119	052083	EZ ELECTRIC INSURANCE CERTIFICATE EXPIRES END OF MAY HAVE CERTIFICATE EXTENDED



Report 06 was generated to locate in the superintendents diaries any references to efforts by the contractor to coordinate the work of the excavation subcontractor.



DCRS NO 101  
PROJECT: CENTRAL MAINTENANCE ADDITION ROSWELL, GEORGIA  
REPORT NO: 06  
FILE NO: DIARIES

REPORT TITLE: LIST OF ALL DOCUMENTS  
BY DOCUMENT CONTROL NUMBER AND DATE RELATIVE TO  
ABC EXCAVATING ACTIVITIES ON THE PROJECT

CONTROL NUMBER	DATE
141	031483
142	031583
143	031683
144	031783
145	031883
147	032183
150	032483
151	032583
153	032883
154	032983
159	040483
160	040583
161	040783
162	040883
163	030983
164	031083
165	041183
181	042983
184	050283
185	050383
185A	050383





As the research continued into the excavation delay a decision was made to look at all the site work/excavation field operations and identify the subcontractors involved. Report 07 was generated to handle this research.



DCRS NO: 101  
PROJECT: CENTRAL MAINTENANCE ADDITION ROSWELL, GEORGIA  
REPORT NO: 07  
FILE NO: DIARIES

REPORT TITLE: LIST OF ALL DOCUMENTS  
BY DOCUMENT CONTROL NUMBER AND DATE AND CONTRACTOR RELATIVE TO  
EXCAVATION OPERATIONS ON THE PROJECT

CONTROL NUMBER	DATE	SUBCONTRAC TOR
142	031583	ABC
142	031583	ABC
143	031683	ABC
143	031683	ABC
144	031783	ABC
144	031783	ABC
145	031883	ABC
147	032183	ABC
150	032483	ABC
151	032583	ABC
153	032883	ABC
154	032983	ABC
160	040583	ABC
161	040783	ABC
162	040883	ABC
162	040883	ABC
163	030983	ABC
164	031083	ABC
165	041183	ABC
178A	042683	CC
179	042783	CC
180	042283	CC
181	042983	ABC
184	050283	ABC
185	050383	CC
185	050383	ABC
186	050483	CC
186	050483	CC
187	050583	CC
188	050683	CC
188	050683	CC
190	050983	CC
190	050983	CC
191	051083	CC
192	051183	CC
194	051383	CC
197	051783	GIM
198	051883	GIM
199	051983	ADL
200	052083	ADL
201	052183	ADL
202	052383	ADL



DCRS NO: 101  
PROJECT: CENTRAL MAINTENANCE ADDITION ROSWELL, GEORGIA  
REPORT NO: 07  
FILE NO: DIARIES

REPORT TITLE: LIST OF ALL DOCUMENTS  
BY DOCUMENT CONTROL NUMBER AND DATE AND CONTRACTOR RELATIVE TO  
EXCAVATION OPERATIONS ON THE PROJECT

CONTROL NUMBER	DATE	SUBCONTRAC TOR
203	052483	ADL
209	052583	ADL
208	053083	ADL
209	060183	ADL
210	060283	ADL





Bad weather might have been a factor in the excavation delay, therefore, Report 08 was developed to identify when the periods of bad weather occurred and to support further analysis.



DCRS NO: 101  
PROJECT: CENTRAL MAINTENANCE ADDITION ROSWELL, GEORGIA  
REPORT NO: 08  
FILE NO: DIARIES

REPORT TITLE: LIST OF ALL DOCUMENTS  
BY DOCUMENT CONTROL NUMBER AND DATE RELATIVE TO  
THE INABILITY TO WORK CAUSED BY BAD WEATHER

CONTROL NUMBER	DATE
46	031983
48	032283
55	033083
82	043083
93	051283



Later, a check of all concrete placement dates was desired, therefore, Report 09 was generated.





DCRS NO: 101  
 PROJECT: CENTRAL MAINTENANCE ADDITION ROSWELL, GEORGIA  
 REPORT NO: 09  
 FILE NO: DIARIES

REPORT TITLE: LIST OF ALL DOCUMENTS  
 BY DOCUMENT CONTROL NUMBER AND DATE AND CONTRACTOR RELATIVE TO  
 THE CONCRETE PLACING ACTIVITIES

CONTROL NUMBER	DATE	CONTRACTOR
0143	031683	ABC
0174	042183	GC
0175A	042283	GC
0176	042383	GC
0177A	042583	GC
0178A	042683	GC
0186	050483	GC
0188	050683	GC
0190	050983	GC
0191	051083	GC
0194	051383	GC
0202	052383	GC
0203	052483	GC
0209	052583	GC
0205	052683	GC
0206	052783	GC



To develop an "as built" schedule Report 10 was generated to list all work by CSI Activity Code and by subcontractor. Report 11 was generated to plot the activities against a time scale.



DCRS NO: 101  
 PROJECT CENTRAL MAINTENANCE ADDITION ROSWELL, GEORGIA  
 REPORT NO. 10  
 FILE NO. DIARIES

REPORT TITLE LIST OF ALL DOCUMENTS  
 BY DOCUMENT CONTROL NUMBER AND DATE AND CONTRACTOR  
 IDENTIFYING ALL CONTRACTOR WORK DAYS AND CSI ACTIVITY CODE

CONTROL NUMBER	DATE	CONTRACTOR	CSI ACT CODE
0137	030983	GC	
0141	031483	ABC	
0155	033083	GC	
0135	030783	GC	01.01
0136	030883	GC	01.01
0128	031083	GC	01.01
0139	031183	GC	01.01
0151	032583	STF	01.01
0154	032983	ABC	01.01
0159	040483	ABC	01.01
0191	051083	RSF	01.01
0191A	051083	GC	01.01
0195	051483	RSI	01.01
0196	051683	GIM	01.01
0147	032183	ABC	01.02
0150	032483	AEC	01.02
0185A	050383	AEC	01.02
0205	052683	ADL	01.02
0210	060283	ADL	01.02
0233	063083	GC	01.02
0135	030783	GC	01.03
0135	030783	GC	01.03
0138	031083	CC	01.05
0139	031183	GC	01.05
0137	030983	GC	01.07
0141	031483	GC	01.07
0161	040783	GC	01.09
0231	062883	GC	01.09
0165	041183	ABC	01.10
0230	062783	GC	01.20
0231	062883	GC	01.20
0231	062883	GC	01.20
0142	031583	ABC	02.30
0143	031683	ABC	02.30
0144	031783	ABC	02.30
0144	031783	ABC	02.30
0150	032483	ABC	02.30
0151	032583	ABC	02.30
0153	032883	ABC	02.30
0154	032983	ABC	02.30
0160	040583	ABC	02.30
0161	040783	ABC	02.30





To develop an "as built" schedule Report 10 was generated to list all work by CSI Activity Code and by subcontractor. Report 11 was generated to plot the activities against a time scale.



DCRS NO: 101  
 PROJECT CENTRAL MAINTENANCE ADDITION ROSWELL, GEORGIA  
 REPORT NO. 10  
 FILE NO DIARIES

REPORT TITLE LIST OF ALL DOCUMENTS  
 BY DOCUMENT CONTROL NUMBER AND DATE AND CONTRACTOR  
 IDENTIFYING ALL CONTRACTOR WORK DAYS AND CSI ACTIVITY CODE

CONTROL NUMBER	DATE	CONTRACTOR	CSI ACT CODE
0137	030983	GC	
0141	031483	ABC	
0155	033083	GC	
0135	030783	GC	01.01
0136	030883	GC	01.01
0138	031083	GC	01.01
0139	031183	GC	01.01
0151	032583	STF	01.01
0154	032983	ABC	01.01
0159	040483	ABC	01.01
0191	051083	RSF	01.01
0191A	051083	GC	01.01
0195	051483	RSI	01.01
0196	051683	GIM	01.01
0147	032183	AEC	01.02
0150	032483	AEC	01.02
0185A	050383	AEC	01.02
0205	052683	ADL	01.02
0210	060283	ADL	01.02
0233	063083	GC	01.02
0135	030783	GC	01.03
0135	030783	GC	01.03
0138	031083	CC	01.05
0139	031183	GC	01.05
0137	030983	GC	01.07
0141	031483	GC	01.07
0161	040783	GC	01.09
0231	062883	GC	01.09
0165	041183	ABC	01.10
0230	062783	GC	01.20
0231	062883	GC	01.20
0231	062883	GC	01.20
0142	031583	ABC	02.30
0143	031683	ABC	02.30
0144	031783	ABC	02.30
0144	031783	ABC	02.30
0150	032483	ABC	02.30
0151	032583	ABC	02.30
0153	032883	ABC	02.30
0154	032983	ABC	02.30
0160	040583	ABC	02.30
0161	040783	ABC	02.30



DCRS NO: 101  
PROJECT: CENTRAL MAINTENANCE ADDITION ROSWELL, GEORGIA  
REPORT NO: 10  
FILE NO: DIARIES

REPORT TITLE: LIST OF ALL DOCUMENTS  
BY DOCUMENT CONTROL NUMBER AND DATE AND CONTRACTOR  
IDENTIFYING ALL CONTRACTOR WORK DAYS AND CSI ACTIVITY CODE

CONTROL NUMBER	DATE	CONTRACTOR	CSI ACT CODE
0162	040883	ABC	02.30
0162	040883	ABC	02.30
0163	030983	ABC	02.30
0164	031083	ABC	02.30
0165	041183	ABC	02.30
0178A	042683	GC	02.30
0179	042783	GC	02.30
0180	042283	GC	02.30
0181	042983	ABC	02.30
0184	050283	ABC	02.30
0185	050383	ABC	02.30
0142	031583	ABC	02.50
0143	031683	ABC	02.50
0145	031883	ABC	02.50
0147	032183	ABC	02.50
0185	050383	GC	02.60
0186	050483	GC	02.60
0186	050483	GC	02.60
0187	050583	GC	02.60
0188	050683	GC	02.60
0188	050683	GC	02.60
0190	050983	GC	02.60
0190	050983	GC	02.60
0191	051083	GC	02.60
0192	051183	GC	02.60
0194	051383	GC	02.60
0197	051783	GIM	02.60
0198	051883	GIM	02.60
0199	051983	ADL	02.80
0200	052083	ADL	02.80
0201	052183	ADL	02.80
0202	052383	ADL	02.80
0203	052483	ADL	02.80
0209	052583	ADL	02.80
0208	053083	ADL	02.80
0209	060183	ADL	02.80
0210	060283	ADL	02.80
0273	042083	GC	03.20
0275	042283	GC	03.20
0277	042583	GC	03.20
0278	042683	GC	03.20
0242	031583	ABC	03.30





DCRS NO: 101  
PROJECT: CENTRAL MAINTENANCE ADDITION ROSWELL, GEORGIA  
REPORT NO: 10  
FILE NO: DIARIES

REPORT TITLE: LIST OF ALL DOCUMENTS  
BY DOCUMENT CONTROL NUMBER AND DATE AND CONTRACTOR  
IDENTIFYING ALL CONTRACTOR WORK DAYS AND CSI ACTIVITY CODE

CONTROL NUMBER	DATE	CONTRACTOR	CSI ACT CODE
043	031683	ABC	03.30
073	042083	GC	03.30
074	042183	GC	03.30
074	042183	GC	03.30
075	042283	GC	03.30
075	042283	GC	03.30
075A	042283	GC	03.30
076	042383	GC	03.30
076	042383	GC	03.30
076	042383	GC	03.30
077	042583	GC	03.30
077	042583	GC	03.30
077A	042583	GC	03.30
078	042683	GC	03.30
078	042683	GC	03.30
078A	042683	GC	03.30
000	052083	GC	03.30
002	052383	GC	03.30
002	052383	GC	03.30
003	052483	GC	03.30
003	052483	GC	03.30
009	052583	GC	03.30
009	052583	GC	03.30
005	052683	GC	03.30
005	052683	GC	03.30
006	052783	GC	03.30
006	052783	GC	03.30
079	042783	PHB	04.30
080	042283	PHB	04.30
080	042283	GC	04.30
080A	042883	PHB	04.30
081	042983	PHB	04.30
081	042983	GC	04.30
081A	042983	PHB	04.30
082	043083	PHB	04.30
082	043083	GC	04.30
084	050283	PHB	04.30
084	050283	GC	04.30
084A	050283	PHB	04.30
085	050383	PHB	04.30
086	050483	PHB	04.30
011	060383	GC	06.10



DCRS NO: 101  
 PROJECT: CENTRAL MAINTENANCE ADDITION ROSWELL, GEORGIA  
 REPORT NO: 10  
 FILE NO: DIARIES

REPORT TITLE: LIST OF ALL DOCUMENTS  
 BY DOCUMENT CONTROL NUMBER AND DATE AND CONTRACTOR  
 IDENTIFYING ALL CONTRACTOR WORK DAYS AND CSI ACTIVITY CODE

CONTROL NUMBER	DATE	CONTRACTOR	CSI ACT CODE
212	060483	GC	06.10
214	060683	GC	06.10
215	060783	GC	06.10
216	060883	GC	06.10
221	061483	GC	06.20
187	050583	RSI	07.40
188	050683	RSI	07.40
190	050983	RSI	07.40
191	051083	RSI	07.40
192	051183	RSI	07.40
194	051383	RSI	07.40
195	051483	RSI	07.40
196	051683	RSI	07.40
197	051783	RSI	07.40
198	051883	RSI	07.40
208	053083	GC	08.20
209	060183	GC	08.20
221	061483	GC	08.20
212	060483	GC	08.30
214	060683	GC	08.30
215	060783	GC	08.30
216	060883	GC	08.30
216	060883	GC	08.30
217	060983	GC	09.20
218	061083	GC	09.20
219	061183	GC	09.20
220	061383	GC	09.20
222	061583	GC	09.90
222	061583	GC	09.80
168	041483	STP	11.10
169	041583	STP	11.10
171	041883	STP	11.10
196	051683	GC	11.10
197	051783	GC	11.10
198	051883	GC	11.10
199	051983	STP	11.10
200	052083	GC	11.10
166	041283	STP	15.10
167	041383	STP	15.10
168	041483	STP	15.10
223	061683	STP	15.60
224	061783	STP	15.60



DCRS NO: 101  
PROJECT: CENTRAL MAINTENANCE ADDITION ROSWELL, GEORGIA  
REPORT NO: 10  
FILE NO: DIARIES

REPORT TITLE: LIST OF ALL DOCUMENTS  
BY DOCUMENT CONTROL NUMBER AND DATE AND CONTRACTOR  
IDENTIFYING ALL CONTRACTOR WORK DAYS AND CSI ACTIVITY CODE

CONTROL NUMBER	DATE	CONTRACTOR	CSI ACT CODE
024	061783	STP	15.60
025	062083	STP	15.60
029	062483	STP	15.60
026	062283	EZE	16.00
028	062383	EZE	16.00
029	062483	EZE	16.00
071	041883	EZE	16.10
072	041983	EZE	16.10
073	042083	EZE	16.10





DCRSNO: 101

PROJECT: CENTRAL MAINTENANCE ADDITION ROSWELL, GEORGIA  
FILE NO: CORRESPONDENCE

LIST OF THE PROJECT CORRESPONDENCE FILE

CONTROL NUMBER	DOCUMENT DATE	OFFICE TO	OFFICE FROM	SUBJECT	DOCUMENT ABSTRACT
	030783	S&DE	OCCO	01	PROPOSED CONTRACTORS LIST
	030883	S&DE	OCCO	01	MATERIAL SOURCES
	030883	S&DE	OCCO	01	APPOINTMENT OF SUPERINTENDENT
	030983	S&DE	OCCO	01	SUBMITTAL OF INSURANCE CERTIFICATES
	031083	S&DE	OCCO	01	BUILDING PERMIT TRANSMITTAL
	031183	S&DE	OCCO		TRANSMITTAL OF SCHEDULE S-1
	031683	S&DE	OCCO	01	NOTICE OF INTENT TO FILE CLAIM C-1
	032183	S&DE	OCCO	01	P/R SUBMITTAL
	032483	S&DE	OCCO	02	DISCREPANCY IN FOOTING WIDTH
	032583	S&DE	OCCO	02	REQUEST FOR DISPOSITION OF TRANSFORMER VAULT AT STATION 13 PLUS 50 LEFT
	032883	S&DE	OCCO	01	P/R SUBMITTAL
	040183	S&DE	OCCO	01	ABC WILL BEGIN OPNS 04/04/83. PHILLIPS WILL WORK DOUBLE SHIFTS STARTING 04/27/83 TO GET PROJECT ON SCHEDULE
	040183	S&DE	OCCO	01	
	040483	S&DE	OCCO	01	P/R SUBMITTAL
	040583	S&DE	OCCO	01	EEO AND MBE REPT SUBMITTAL
	040683	S&DE	OCCO		LIFT LATE, SCHEDULE TO BE REVISED TO PLACE FLOOR AFTER ROOF TO KEEP COMMITMENT TO ROOF SUB
	040683	S&DE	OCCO		
	040783	S&DE	OCCO	01	PAY REG. NO 1
	040883	S&DE	OCCO	01	CPM SCHEDULE S-2 SUBMITTAL
	041183	S&DE	OCCO	01	P/R SUBMITTAL
	041983	S&DE	OCCO	01	P/R SUBMITTAL
	042083	S&DE	OCCO	01	INTENT TO FILE CLAIM AS SOON AS DELIVERY DATE OF LIFT IS KNOWN
	042283	S&DE	OCCO	01	PROPOSED REDUCTION OF PRICE ON ENN NO 1, HVAC UNIT
	042583	S&DE	OCCO	01	P/R SUBMITTAL
	042283	S&DE	OCCO	01	REQUEST SUBSTITUTION OF KELLY OVERHEAD DOOR FOR RANGER OVERHEAD DOOR
	050283	S&DE	OCCO	01	P/R SUBMITTAL
	050683	S&DE	OCCO	01	PAY REQUEST NO 2 SUBMITTAL
	050983	S&DE	OCCO	01	P/R SUBMITTAL
	051183	S&DE	OCCO	01	PRICE NOT AVAILABLE FOR CN-2, REQUEST TIME AND MATERIAL BASIS
	051683	S&DE	OCCO	01	P/R SUBMITTAL
	051783	S&DE	OCCO	01	EEO/MBE REPORT SUBMITTAL
	051883	S&DE	OCCO	01	CPM SCHEDULE S-3 SUBMITTAL DELIVERY OF HYDRAULIC LIFT UNIT



DCRBNO: 101

PROJECT: CENTRAL MAINTENANCE ADDITION ROSWELL, GEORGIA  
FILE NO: CORRESPONDENCE

## LIST OF THE PROJECT CORRESPONDENCE FILE

CONTROL NUMBER	DOCUMENT DATE	OFFICE TO	OFFICE FROM	SUBJECT	DOCUMENT ABSTRACT
	052383	S&DE	OCCO	01	P/R SUBMITTAL
	052683	S&DE	OCCO	01	INSORMLE CERTIFICATE - E2 ELECTRIC - SUBMITTAL
	060183	S&DE	OCCO	01	KELLEY OVERHEAD DOOR WARRANTY SUBMITTAL
	060483	S&DE	OCCO	01	CLAIM C-1, DELAY DUE TO LATE DELIVERY OF HYDRAULIC LIFT UNIT
	060683	S&DE	OCCO	01	P/R SUBMITTAL
	060883	S&DE	OCCO	01	PAY REQUEST NO. 3
	061083	S&DE	OCCO	01	EEO/MBE REPORT SUBMITTAL
	061483	S&DE	OCCO	01	P/R SUBMITTAL
	061683	S&DE	OCCO	01	REVISED PAY REQUEST NO 3 SUBMITTAL
	062083	S&DE	OCCO		P/R SUBMITTAL
	062383	S&DE	OCCO	01	ANTICIPATE B/O DATE 06/27/83 THREE DAYS PUNCH LIST FOLLOWS SCHEDULE INSPECTION 06/27/83
	062883	S&DE	OCCO	01	OPERATING MANUALS SUBMITTAL OVERHEAD DOOR AND HVAC UNITS 1 THRU 2
	062983	S&DE	OCCO	01	EEO/MBE REPORT SUBMITTAL
	062983	S&DE	OCCO	01	P/R SUBMITTAL
	070583	S&DE	OCCO	01	P/R SUBMITTAL
	070883	S&DE	OCCO	01	EEO/MBE REPORT
	071283	S&DE	OCCO	01	PAY REQUEST NO. 4 SUBMITTAL
	081183	OCCO	S&DE	01	SUBCONTRACTORS APPROVED
	081483	OCCO	S&DE	02	
	081483	OCCO	S&DE	02	
	081683	OCCO	S&DE	01	FEATURE ARTICLE ON PROJECT IN ROSWELL NEWS
	081683	OCCO	S&DE	01	CPM SCHEDULE APPROVED
	082283	OCCO	S&DE	01	ABC BEHIND DIRECTED TO BRING PROJECT UP TO SCHEDULE
	082983	OCCO	S&DE	02	DEMOLISH TRANSFORMER VAULT BACKFILL
	082983	OCCO	S&DE	02	
	083083	OCCO	S&DE	02	
	083083	OCCO	S&DE	02	
	083183	OCCO	S&DE	02	CITY ORDINANCE REQUIRES BARRICADES BE LIGHTED, DIRECTED TO LIGHT BARRICADES ON 4TH STREET
	040183	OCCO	S&DE	02	CORRECT DIMENSION OF FOOTING IS AS SHOWN ON SHEET 29
	041283	OCCO	S&DE	02	BTU RATING OF HVAC UNIT NO 'S 3 & 4, CHANGED TO 75,000 BTU. SUBMIT CREDIT PROPOSAL



DCRSNO: 101

PROJECT: CENTRAL MAINTENANCE ADDITION ROSWELL, GEORGIA  
FILE NO: CORRESPONDENCE

LIST OF THE PROJECT CORRESPONDENCE FILE

CONTROL NUMBER	DOCUMENT DATE	OFFICE TO	OFFICE FROM	SUBJECT	DOCUMENT ABSTRACT
	041383	OCCO	S&DE	02	TRANSFORMER VAULT IN CN NO. 2.
	041483	OCCO	S&DE	01	CHANGE ORDER TO BE ISSUED SHORTLY REVISED CPM UNDER REVIEW YOU ARE REQUIRED TO COMPLETE PROJECT BY 06/15/83
	041883	OCCO	S&DE	02	HYDRAULIC LIFT AVAILABLE WEEK OF 05/09/83
	042983	OCCO	S&DE	01	PROPOSAL FOR DEDUCT ON CN NO. 1 ACCEPTED
	050383	OCCO	S&DE	02	SUBSTITUTION OF RANGER DOOR APPROVED
	050383	OCCO	S&DE	02	SKETCH SK003 ENCLOSED CHANGES ROOT SUBMIT PROPOSAL
	051083	OCCO	S&DE	01	SAFETY INSPECTION MADE 05/06/83 COPY ATTACHED
	051283	OCCO	S&DE	01	EEO/MBE REPORT DUE 5TH DAY OF MONTH SUBMIT APRIL ASAP
	051383	OCCO	S&DE		ENCLOSED IS C.O. NO. 1 SIGN AND RETURN
	051983	OCCO	S&DE	01	
	052083	OCCO	S&DE	01	EZ ELECTRIC INSURANCE CERTIFICATE EXPIRES END OF MAY HAVE CERTIFICATE EXTENDED
	052583	OCCO	S&DE	01	ENCLOSED IS CO NO. 2 SIGN & RETURN
	052783	OCCO	S&DE	01	ACKNOWLEDGES RECEIPT OF CPM S-3 IT IS UNDER REVIEW BY CITY
	060983	OCCO	S&DE	01	ACKNOWLEDGES RECEIPT OF CLAIM C-1
	061083	OCCO	S&DE	01	BEHIND BASED ON SCHEDULE S-1 TIME EXTENSION ONLY IF CLAIM IS MERITORIOUS
	061383	OCCO	S&DE	01	RETURNING PAY REQUEST NO. 3 RE-SUBMIT
	062083	OCCO	S&DE	01	FORWARD ACCIDENT REPORT ON MIDIMS
	062183	OCCO	S&DE	01	REQUEST DATE OF ANTICIPATED B/O
	062783	OCCO	S&DE	01	B/O INSPECTION MADE 06/27/83 ACCEPTED PUNCH LIST TO BE COMPLETE IN SEVEN (7) DAYS
	062983	OCCO	S&DE	01	PUNCH LIST COMPLETE 06/29/83
	022883	COFR	OCCO		ENCLOSED SIGNED CONTRACT AND P + P BOND





DCRSNO: 101

PROJECT: CENTRAL MAINTENANCE ADDITION ROSWELL, GEORGIA  
FILE NO: CORRESPONDENCE

## LIST OF THE PROJECT CORRESPONDENCE FILE

CONTROL NUMBER	DOCUMENT DATE	OFFICE TO	OFFICE FROM	SUBJECT	DOCUMENT ABSTRACT
	031783	COFR	OCCO	01	
	022383	OCCO	COFR	01	
	030583	OCCO	COFR		
	032383	OCCO	COFR		
	071683	OCCO	COFR		











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